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the news digest magazine

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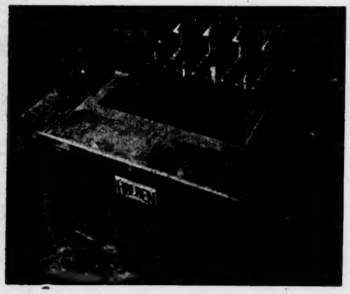
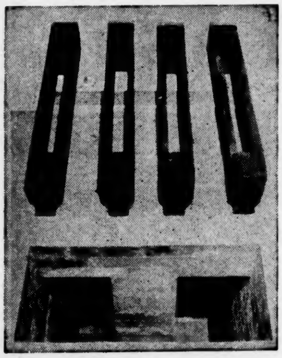
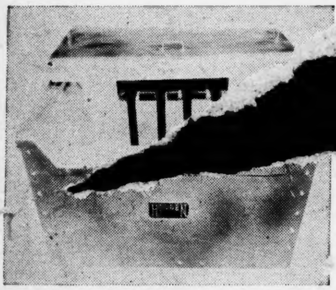


Type 202 Electrode Furnace, Temperature range 300-1750° F.



Type 701-4 Submerged Electrode Unit with ceramic pot for neutral hardening and annealing 1000-2300°F.



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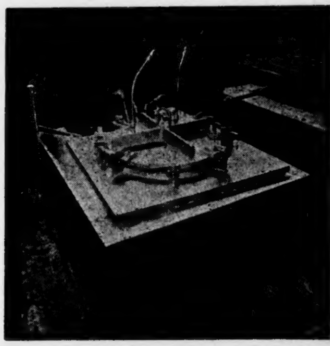
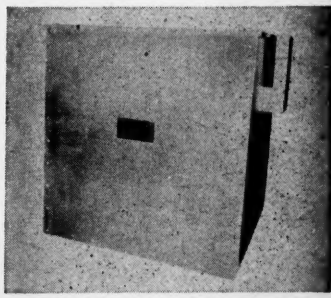
[illegible]ealing	Wire Patenting
[illegible]	Desanding
[illegible]al annealing	Bright tempering

Liquid Carburizing
Aluminum heat treating
High Speed steel hardening
Cleaning of rubber molds



Liquid Nitriding Furnace.

Gas Fired Type 212, Temperature range 300-1700° F.



Furnace assembly of martempering-austempering unit, gas fired for small production application.

THE A. F. HOLDEN COMPANY

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Metals Review

THE NEWS DIGEST MAGAZINE • **VOLUME XXVI, No. 6** **June, 1953**

MARJORIE R. HYSLOP, Editor
BETTY A. BRYAN, Associate Editor
RAY T. BAYLESS, Publishing Director
GEORGE H. LOUGHNER, Production Manager
A. P. FORD, Advertising Manager

• • •

DISTRICT MANAGERS

Donald J. Billings
7301 Euclid Ave., Cleveland 3, Ohio
UTah 1-0200

John F. Tyrrell
John B. Verrier, Jr.
55 West 42nd St., New York 36
CHickering 4-2713

Ralph H. Cronwell,
482 Burton Ave., Highland Park, Ill.
HIghland Park 2-4263

• • •

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James B. Austin for President

George Roberts for Vice-President

W. A. Pennington for Treasurer

G. M. Young for Trustee

Robert Raudebaugh for Trustee

National Officer Nominees Announced

NOMINATIONS for new national officers of the American Society for Metals have been announced by the Nominating Committee, which met in New York on May 19, under the chairmanship of W. M. Baldwin, Jr., Case Institute of Technology.

J. B. Austin, currently serving as vice-president, was nominated for president, George Roberts, chief metallurgist, Vanadium-Alloys Steel Co., has been selected as the nominee for vice-president, and W. A. Pennington, chief chemist and metallurgist, Carrier Corp., has been selected as nominee for treasurer.

Two additions proposed for the Board of Trustees are G. M. Young, technical director, Aluminum Co. of Canada, Ltd., and Robert Raudebaugh, acting director of the school of chemical engineering, Georgia Institute of Technology.

In accordance with the Constitution of the American Society for Metals, additional nominations for any of these posts may be made by written communications addressed to the secretary of the Society and signed by any 50 members. If no such additional nominations are received prior to July 15, nominations shall be closed and at the annual meeting in October 1953 the secretary will cast the unanimous vote of the members for these candidates.

J. B. Austin

James B. Austin, selected by the committee for president, received his degree in chemical engineering from Lehigh University in 1925, and a Ph.D. in physical chemistry from Yale University in 1928. He joined the staff of the research laboratory of United States Steel Corp. in 1928, was made assistant director in 1944, and became director of research for the company in 1946.

Dr. Austin was chairman of the New York Chapter A.S.M. in 1944, and has served on the publications committee and as a trustee for the Society. He gave the Campbell Memorial Lecture in 1946, and in 1941 gave a series of educational lectures which were later published by the Society as "The Flow of Heat in Metals". He has been a trustee for the American Ceramic Society, and vice-chairman of the Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers, as well as a member of the executive committee of the Institute of Metals Division of A.I.M.E. He is also a member of the chemical warfare committee of the Research and Development Board, Department of Defense.

G. A. Roberts

George A. Roberts is a graduate of the Carnegie Institute of Technology where he received a B.S. degree in metallurgy in 1939. He attended the U. S. Naval Academy from 1937 to 1939 and during the summer of 1938 was employed by the Bell Telephone Laboratories in New York City.

After graduating from Carnegie Tech., Dr. Roberts was teaching assistant in physical metallurgy and ferrous metallography in the same school. He received a M.S. degree in 1941.

Dr. Roberts joined Vanadium-Alloys Steel Co. at the company's Latrobe, Pa., plant in 1940. He returned that same year as a Vanadium-Alloys Steel Co. graduate fellow and was granted a Ph.D. degree from Carnegie Institute of Technology in 1942. He was appointed research metallurgist at Vanadium-Alloys in 1942 and is today the company's chief metallurgist.

He is co-author of "Tool Steels", published by the American Society for Metals in 1946.

Dr. Roberts served as an A.S.M. trustee from 1951 to 1953.

W. A. Pennington

W. A. Pennington, nominee for treasurer, received his Ph.D. degree from Iowa State College and served as head of the department of mathematics at Union College, later joining American Rolling Mill Co. as a research engineer. After some time at the Mellon Institute as an industrial fellow, he left to take his present position as chief chemist and metallurgist at the Carrier Corp., Syracuse, N. Y.

Dr. Pennington was awarded the Henry Marion Howe Medal in 1947. In 1951 he served as chairman of the A.S.M. Publications Committee.

G. M. Young

G. M. Young, nominee for trustee, a native of Saskatoon, Saskatchewan, was educated at the University of Saskatchewan and McGill University, graduating in 1930 with a B.S. degree in metallurgical engineering. His industrial experience has taken him from metallurgical assistant at the Aluminum Co. of Canada's Toronto plant, to chief metallurgist at the company's Kingston plant and finally to technical director of the company's Montreal plant, the position he holds at the present time.

Mr. Young has served as a member of the executive committee of the Montreal Chapter A.S.M. since 1947, as chairman of the Montreal Chapter during 1951-1952, and was a conferee to the World Metallurgical Congress. He also is the author of several papers relating to the casting and fabrication of aluminum and its alloys.

Robert Raudebaugh

Robert Raudebaugh, the second nominee for trustee, was born in Dayton, Ohio. He received a B.S. degree in chemical engineering from Carnegie Institute of Technology in 1932, and a Ph.D. degree in physical metallurgy from Purdue University in 1945. He has served in the metallurgical departments and research laboratories of Armco Steel Corp., Oak Ridge National Laboratory, and International Nickel Co., and held teaching positions at Purdue and the University of Rochester. Since 1948 Prof. Raudebaugh has had charge of all metallurgical work and directed government-sponsored research projects for the State Experiment Station at Georgia Tech.

Prof. Raudebaugh has been a member of the Rochester, Cincinnati, Indianapolis and Georgia Chapters of the A.S.M., and has held various chapter offices. He is the author of "Nonferrous Physical Metallurgy", published by Pitman Publishing Co. in 1952.

Tells How Economic Trends Affect Iron And Steel Industry

Reported by J. McNichol
Algoma Steel Corp.

Karl L. Fetters, assistant to the vice-president in charge of operations, Youngstown Sheet & Tube Co., spoke at the May meeting of the Northern Ontario Chapter. He opened his discussion "Recent Economical Trends in the Iron and Steel Industry" by stating that earnings, expressed as a percentage of investment costs, have been declining since about 1940, largely as a result of higher costs of labor and raw materials which far outweigh increases in steel prices. It has thus become imperative to keep production costs to a minimum and to improve the yield of prime quality products if the industry is to remain solvent. For this reason, the value of technical personnel had become of the greatest importance throughout the iron and steel industry.

Reviewing the continuing expansion of steel production, Dr. Fetters stated that, in the U.S.A., there has been a 45% increase in productive capacity since 1939. The increase in production is due not to the introduction of fundamentally new processes but to the construction of new plants and the extension of existing plants. With reference to further expansion, he predicted a greater dependence upon imported ores and upon newly discovered deposits such as those found in Labrador. Concentration of native low-grade ores will probably be a big industry.

Dr. Fetters continued by saying that, so far, no basically new process of iron or steelmaking had been found which could compete economically with the existing ones, even though these have not changed essentially since their inception. Present methods of iron and steelmaking have, however, been made much more efficient by the application of science.

New concepts in the iron and steel industry are being formed, nevertheless, declared Dr. Fetters, such as the turbohearth; continuous casting of steel; hot extrusion and cold extrusion of steel; cluster mills; and the low-shaft blast furnace. He visualized future plants as integrating all these processes.

Acta Metallurgica

Members of the American Society for Metals who are subscribers to *Acta Metallurgica* should send their renewals to the business manager in New York City rather than to A.S.M. headquarters in Cleveland. The address for renewals and all correspondence concerning subscriptions is as follows:

Wallace Waterfall,
Business Manager
Acta Metallurgica
57 East 55th St.
New York 22, N. Y.

Describes Metals for Use in Jet Engines

Reported by R. C. Pocock
Chief Engineer, Eng. Research Lab.
Bendix Products Div.

At the May meeting of the Notre Dame Chapter, Herman H. Hanink of the Curtiss-Wright Corp., Wright Aeronautical Division, gave a talk on "Aircraft Gas Turbine Metallurgy as Related to Engine Design".

Mr. Hanink prefaced his talk with a discussion of the engineering performance of the piston and gas turbine type power plants for aircraft installations.

Slides describing the properties of metals used in past and present production engines were shown and design data given for each alloy.

New developments in cast magnesium alloys have been quite rapid, the speaker noted. The temperature range for magnesium has been increased about 300° F. by the use of rare earth metal additions. Titanium is useful if economics permit. Stainless steels have been very useful in many applications, especially the modified 12% chromium type. Low alloy, heat resistant steels will figure more prominently in new designs, and will probably replace stainless steel parts by a major proportion. Special high-temperature alloys under development show promise.

The speaker showed slides, starting at the front of the engine, which illustrated what materials were used in each section and giving the reason for choice of each alloy.

Note Continuous Casting Progress

T. W. Ratcliffe (Left), and Isaac Harter, Jr., (Center), Assistant Engineer and Engineer in Charge of Continuous Casting, Babcock and Wilcox Co., Are Shown With W. M. Farnsworth, Discussion Leader, After Their Discussion of "Continuous Casting of Steel" at Canton-Massillon Chapter. (Photograph by Edward E. Miller, plant photographer, Republic Steel Corp.)

Reported by J. M. Brunner
Laboratory Metallurgist
Republic Steel Corp.

The Canton-Massillon Chapter heard Isaac Harter, Jr., and T. W. Ratcliffe, engineer in charge of continuous casting and assistant engineer in charge of continuous casting, respectively, of Babcock and Wilcox Co.'s Tubular Products Division, talk on "Continuous Casting of Steel".

Mr. Harter discussed the technical and economical advantages of continuous casting. Problems of continuous casting include steel composition, temperature, slag, mold design, pouring control, and holding devices.

One of the most important problems in continuous casting is that of automatic pouring control. Because of the high speed of casting, usually 60 in. per min., and as high as 100 in. per min., completely automatic control without excessive "hunting" must be used. Good stoppage control in case of trouble is also necessary. When the cast comes out of the mold, an interior core of approximately 4½ in. diameter is still molten. This necessitates supporting and protection to prevent swelling, which protection is accomplished by after-coolers consisting of roller guides to confine the casting, and water jets of sufficient flow to cool and prevent bursting. The casting is then cut to length by torch cutting in the region of solid cross section. Where 18% croppage has been usual the yield in the continuous casting process with the inherent constant loss of about 18 in. increases with an increase in the size of the heat.

An excellent movie on some of the details of operation was presented, showing views of the preparation for casting and how a leader bar is moved upward through rolls to be used as a temporary bottom and then moved down with the cast. The metal bath level is kept constant by automatic controls regulated by an X-ray unit. A brass water-cooled mold, which must be clean and smooth, has proved to be very successful. The brass mold is cooled with a mile-a-minute water flow and the hot face mold temperature is never over 350/400° F. As far as can be determined, mold wear is negligible and the mold should last forever—barring power loss or accidents.

During the discussion period, it was brought out that segregation is negligible in the cross section and along the length of the heat. Relative to surface conditioning, an all-over skin ground condition, a pickled and spot ground condition, and an as-cast condition from the same heat were rolled to 4 x 4 in. billets and no difference in surface quality was noted.

In addition to the increased savings due to the bypassing of the ingot casting, soaking pits, and blooming stages, technical improvements in surface and structural qualities are indicated.

THIRTY YEARS AGO

Reorganization and expansion of one of the national committees of the Society designated as the Standards Committee is described in December 1922 at the time of the annual appointments of national committees by President T. D. LYNCH†. The committee was expanded to 26 members under the chairmanship of ROBERT M. BIRD†, engineer of tests, Bethlehem Steel Co. A predecessor of the present Metals Handbook Committee, it was divided into four "Subcommittees on Recommended Practices", whose work laid the basis for the present Metals Handbook.

—30—

A new position is announced in the January 1923 issue of the *Transactions* for ARTHUR L. COLLINS, first secretary of the Philadelphia Chapter. Collins transferred from Standard Steel and Bearings, Inc., to the tool and alloy steel department of Horace T. Potts & Co. as sales metallurgist (now sales manager for the Potts organization).

—30—

A winter sectional meeting of the Society was held in Chicago on Feb. 8 and 9, 1923. Luncheon, a technical session, dinner and an evening lecture constituted the first day's program, opened by H. F. WOOD, metallurgist of Wyman-Gordon Co., Ingalls-Shepard Div., chairman of the Chicago Chapter (now vice-president of Wyman-Gordon).

—30—

J. FLETCHER HARPER, metallurgist with Allis-Chalmers Mfg. Co. (now vice-president of Globe-Union Mfg. Co. and an A.S.M. past national president), presided at the afternoon meeting. Speakers included E. J. JANITZKY, metallurgist, Illinois Steel Co. (now U. S. Steel), ROBERT G. GUTHRIE†, metallurgist, Peoples Gas Light & Coke Co. (A.S.M. president in 1930), and ERNEST E. THUM, associate editor of *Chemical & Metallurgical Engineering* (now and since its inception editor of *Metal Progress*).

Receives McFarland Award Of the Penn State Chapter

The Penn State Chapter selected Robert Burns George as the 1953 recipient of the David Ford McFarland Award. Mr. George, who received the award at a dinner meeting in May, gave a talk on "Toolsteels". He is the vice-president of the Vanadium Alloys Steel Co.

The Award was established by the Chapter in 1949 as an annual recognition to a metallurgy alumnus of the Pennsylvania State College.

Burns George received his B. S. degree in metallurgy in 1922. Prior to his present company connection he was employed by the U. S. Steel Corp. at Gary, Ind., and Homestead, Pa. Shortly after that he entered the metallurgical department at Vanadium Alloys, where he has served as metallurgist, chief metallurgical engineer, and vice-president in charge of sales in his 29 years of service.

Mr. George has been active in many professional societies. He has served as a member of the executive committee of the Pittsburgh Chapter A.S.M., and was a member of the original Handbook Committee. He is the author of many papers on toolsteels and co-author of the A.S.M. book "Toolsteel".

Cites Potentials of High-Temperature Metals at Buffalo

Reported by A. E. Leach
Metallurgist, Bell Aircraft Co.

Molybdenum-base alloys and ceramels will be the giants of high-temperature materials in the future, according to H. C. Cross, supervising metallurgist at Battelle Memorial Institute, in a talk before the Buffalo Chapter on the "Significance of Test Data on Design for High-Temperature Service".

Pure molybdenum and molybdenum-base alloys, tested at Battelle Memorial Institute, had better creep-rupture properties than Stellite 31 and N 155 alloys, two of the so-called "super alloys" which are presently used for high-temperature applications. Though possessing excellent resistance to creep, molybdenum will oxidize readily at elevated temperatures and the oxide which forms offers no protection against further oxidation. This problem has not been solved, but some progress has been made in the development of protective coatings for molybdenum.

Since 1922, when the importance of the phenomenon of creep was first realized, many tests have been devised to determine material properties at elevated temperatures. The most important of these are the creep and stress-rupture tests. The creep test measures the minimum rate at which metals elongate under constant load and constant temperature, and the stress-rupture test measures times for rupture under constant load and temperature. From these data are plotted design curves showing the time-temperature-stress relationship for given elongations. The designer can then predict the behavior of components subject to stress at elevated temperatures, using the design curves. Though this is the basic sequence for designing for high-temperature service many other factors, such as thermal shock, fatigue at high temperatures, structural stability, and the effect of surface deterioration on serviceability enter to complicate the picture.

Of the many elevated temperature tests, the stress-rupture and creep tests are best suited to determine material acceptance for high-temperature applications. The aircraft jet turbine industry, in particular, has made good use of the stress-rupture test.

If designers could be assured of materials having consistent creep and stress-rupture properties, they could build engines of greater efficiency by raising operating temperatures and stress levels. At the present time, both wrought and cast high-temperature alloys sometimes show as much as 100% difference in rupture life, even when test bars are taken from the same heat and sometimes from the same bar of material. These variations have not been adequately explained, and they have forced designers to use operating temperatures and stress levels far below average values in order to prevent isolated component failures. Much research and development has been centered upon the control of chemical composition and fabrication methods in order to develop consistent properties. In a sense, this work is more important than the development of new alloys of better creep-rupture properties, as it allows utilization of the maximum properties of known alloys.

English jet engine manufacturers seized an early lead over companies in this country because their research was concentrated upon learning more about the behavior of the nickel-base Nimonic alloys, even though it was known that their creep-rupture properties were inferior to other alloys with which they were not experienced. In the United States, research was directed at ever better alloys and knowledge of their response to fabrication methods and variations in chemical composition has been slow to develop. Therefore, until the last year or two, we found ourselves forced to use alloys of superior properties at lower operating conditions to eliminate failures.

Schaefer Speaks on Forgings in Texas

A. O. Schaefer, Vice-President in Charge of Engineering and Manufacturing, Midvale Co., Spoke on "Manufacture and Heat Treatment of Forgings" at the Texas Chapter. Shown are, from left: D. J. Martin, Hughes Tool Co.; Mr. Schaefer; and M. W. Phair, Tennessee Coal, Iron and Railroad Co.

Reported by Curtis L. Horn
Engineering Laboratory Department Hughes Gun Co.

A. O. Schaefer, vice-president in charge of engineering and manufacturing for the Midvale Co., spoke recently before the Texas Chapter on the "Manufacture and Heat Treatment of Forgings".

Mr. Schaefer's lecture was confined mainly to large open die forgings. He stated that some benefits derived from forgings are:

1. Ingots such as the "big end up" with hot tops are used for large forgings.
2. Refinement and control of stresses favorable to the finished production are possible.
3. High-density metal is obtained.
4. Flow lines may be controlled.
5. With proper planning optimum characteristics of the forgings may be obtained.
6. Reliable tests of forging quality throughout the forging are available.

Acid openhearth steel is often used for large forgings, mainly because this type of steel is less susceptible to flakes than basic furnace steel. However, with the acid openhearth, steel, phosphorus and sulfur are not removed and this is a disadvantage. Special ingots are designed for each particular job and most ingots are octagonal or fluted in design. The advantage gained from the octagonal or fluted ingot is the increased skin strength and resistance to tearing during forging. A number of various ingot designs have been tried to reduce the splash and spatter during the beginning of the pour which will result in scabs on the ingot surface. On extremely large ingots the ingot is designed with the pouring basin at the bottom, which holds splash and spatter to a minimum.

Heat treatment of these large forgings is carried out in car-type furnaces and vertical furnaces of suitable size to accommodate the forging. Great care is given to the heat treating process so as to allow hydrogen to diffuse from the steel and to eliminate flakes. On extremely large forgings the physical requirements are met by proper alloying and air cooling. The heat treat process varies with the length and shape of the structure. However, a number of large forgings are liquid quenched to obtain physical properties. Furnaces, such as a 85 ft. vertical furnace, are used for some of the larger forgings.

Milwaukee Holds Annual Students Night

T. W. Lippert, Manager, Sales and Technical Service, Titantium Metals Corp. of America (Center), Guest Speaker at Milwaukee Chapter's Annual Students Night, Is Shown With Earl K. Levy of the Milwaukee Baseball Club (left), who was the coffee speaker, and John Beyerstedt, chapter chairman

Reported by William H. Myers
Macwhyte Co.

The Annual Students' Night of the Milwaukee Chapter honored two groups of engineering students. One group was presented by J. E. Schoen, professor from Marquette University, and the other headed by George J. Barker, University of Wisconsin.

T. W. Lippert, manager of sales and technical services, Titanium Metals Corp. of America, presented a talk on "Titanium—Tomorrow's Metal Today". He discussed all phases of the fast-moving titanium development and showed how this new engineering material is of use to us now and important in our future.

In discussing the early history of titanium, the speaker told how in the mid-twenties a vigorous search for new materials for filaments in incandescent lamps laid the groundwork for procedures for producing titanium. Dr. Kroll of Luxemberg developed the method which bears his name shortly after the mid-twenties and this method is used today to produce titanium from its ore. With the advent of the Jet and Atomic Age between 1943 and 1945, the necessity for securing supplies of zirconium, hafnium, and, especially titanium, became apparent, and the Kroll process was put into operation by the U. S. Bureau of Mines and, later by the E. I. duPont de Nemours & Co. Shortly thereafter, Allegheny Ludlum Steel Corp. and the National Lead Co. formed the Titanium Metals Corp. to produce and market ductile titanium metal.

In 1952 the existing producers of titanium in this country manufactured a total of 1100 tons of this vital metal, with a sales price of from $25,000 to $30,000 per ton of finished mill product.

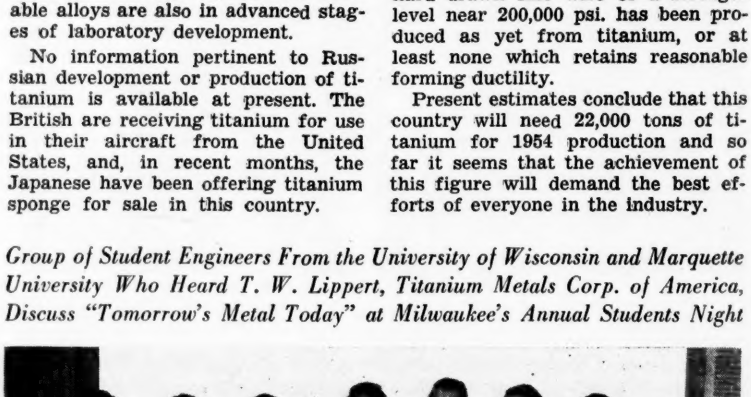
The speaker stated that present manufacturers feel it will be possible to eventually effect considerable savings in the cost of producing titanium by the Kroll method. Research and development are also going forward and there is strong hope that a new electro or electro-thermal process for manufacturing titanium will be perfected.

The biggest single use of titanium today is in the jet engine. One-third of its total weight may eventually be made up of titanium. Experimental uses of titanium include applications in ordnance which is being used in Korea.

Titanium of high purity is necessary for use in ductile, high-strength alloys. Alloys of titanium are applicable to use in very intricate parts of jet engines. Experimental alloys of titanium and aluminum are showing great promise for use where temperatures exceed 1000° F., and heat treatable alloys are also in advanced stages of laboratory development.

No information pertinent to Russian development or production of titanium is available at present. The British are receiving titanium for use in their aircraft from the United States, and, in recent months, the Japanese have been offering titanium sponge for sale in this country.

Group of Student Engineers From the University of Wisconsin and Marquette University Who Heard T. W. Lippert, Titanium Metals Corp. of America, Discuss "Tomorrow's Metal Today" at Milwaukee's Annual Students Night



Walters Dies at Los Alamos

Francis M. Walters, Jr., associate division leader of the Los Alamos Scientific Laboratory's chemistry and metallurgy division, passed away on April 18 after a long period of poor health.

Dr. Walters, who started with the Los Alamos Laboratory in 1946 as associate division leader, had previously been superintendent of the division of physical metallurgy at the Naval Research Laboratory in Washington, D. C.

He was born in Montecello, Ind., in 1888, and was a graduate of the University of Missouri in 1911 with an A.B. degree in physics. He was awarded a Ph.D. in physics by the same school in 1920. His varied career included teaching positions at the Universities of Missouri and Montana, as well as at St. John's University in Shanghai, China. He also conducted metallurgical research for the iron and steel industry, and for his work was awarded the Howe Medal by the American Society for Metals in 1932. He is survived by his wife and three sons.

Titanium ingots of from 3500 to 4000 lb. are now quite common and are being rolled on continuous and reversing mills. Several Milwaukee manufacturers are presently fabricating parts of titanium. However, no hard drawn fine wire of a strength level near 200,000 psi. has been produced as yet from titanium, or at least none which retains reasonable forming ductility.

Present estimates conclude that this country will need 22,000 tons of titanium for 1954 production and so far it seems that the achievement of this figure will demand the best efforts of everyone in the industry.

Tells How Powder Metallurgy Cures Shaping Problems

Reported by Walter Showak
Pennsylvania State College

Amos J. Shaler, newly appointed chief of the division of metallurgy at Pennsylvania State College, gave a talk on the "Flow of Powders and Sands During Compaction" at a meeting of the Penn State Chapter.

The compaction process is used to compact such materials as soils, foundry sands, ceramic materials and metal powders in molds. All industries run into the problem of forming certain shapes, and to solve these problems they have looked to powder metallurgy as a cure.

Tests were run on sands and powders under compaction in order to obtain meaningful figures to compare one powder or sand with another, to choose the right material for each job, and to use better materials for molding use. The tests were also designed to ascertain density distribution, strain distribution, and stress distribution.

A knowledge of strain distribution tells how the material becomes dense, and how the material flows around obstructions and into edges and corners. On the other hand, knowledge of stress distribution helps in the design of die and mold walls, evaluation of forces to be applied, and a knowledge of wall friction for wear and lubrication studies.

Methods had to be devised to explore inside masses of powder without introducing new variables. One of the two techniques used for density distribution studies consisted of the use of parallel graphite lines between layers of powder; when the compact was later sectioned perpendicularly to these lines, they left a pattern of points. The other technique involved the use of a lead sheet perforated with either round or square holes. It is possible to calculate the principal finite strains from the change of shape, rotation, and the change of position of the figures formed in a compacted specimen by the lead grid squares or the pattern of graphite points. Radiography or sectioning methods are used to investigate the form of the lead grids after compaction. The greatest disadvantage of these techniques is the difficulty of getting the grid close to the die wall in order that a prediction of what happens at this important position can be made. This disadvantage can be overcome in some cases by placing strain pistons in the die walls. These strain pistons are connected to strain gages which indicate compaction at the die wall surfaces.

Grid analysis studies showed that foundry sand flow consists of two different mechanisms. Flow first occurs by deformation of the clay-water film that coats the sand grains. The second stage is due to fragmentation of sand grains, but is not important in molding practice. The transition between primary and secondary flow is sharp because only a low shear stress is required to cause maximum flow of the hydrated clay films about sand grains.

Flow of sands depends on the type of bond used, the shape of the sand grains, and method of loading. Molding sands containing angular grains flow appreciably more than round-grained sands. Ramming rather than squeezing produces greater densification in a foundry sand. A combination of flowability and compressibility indices may prove to be a satisfactory measure of the moldability of foundry sands.

New Films

Steel With 1000 Qualities

A 37-min., 16 mm. full-color sound film produced for the Lebanon Steel Foundry, by Roland Reed Productions, Inc., which tells the story of steel castings from design to final inspection and actual applications. The film is narrated so that scientists and laymen will understand and enjoy its message. The film is offered on a free-loan basis. For further information write: Modern Talking Picture Service, Inc., 45 Rockefeller Plaza, New York 20, N. Y.

Manufacture of Cast Iron Pressure Pipe

The Cast Iron Pipe Research Association has produced a sound color motion picture showing the manufacture of modern cast iron pipe, as well as tests used for design, quality control, or specification purposes. To obtain the film please contact: Cast Iron Pipe Research Assoc., 122 South Michigan Ave., Chicago 3, Ill.

Jet Aircraft Blades

Just released by the Utica Drop Forge & Tool Corp., this 16 mm. sound movie pictures the entire manufacturing process from sinking of the forging dies through the various steps of precision forging, machining and final inspection of jet aircraft blades. A wide variety of blades were used to include as many types of modern high-precision manufacturing operations as possible. Prints are available from Henry Zellweger, Utica Drop Forge & Tool Corp., Utica 4, N. Y.

Better, Faster, Cheaper With Welding

A 19-min. film which features case histories of unusual savings in production, maintenance and salvage resulting from the use of proper welding techniques. Additional information may be obtained by writing: Technical Information Service, Dept. "P", Eutectic Welding Alloys Corp., 172nd St. and Northern Blvd., Flushing 58, N. Y.

Talks on Deep Drawing

Reported by C. G. Robinson
Aluminum Co. of Canada, Ltd.

The April meeting of the Western Ontario Chapter featured Stanley R. Cope of the Acme School of Die Design, who spoke on "Deep Drawing". Mr. Cope gave a broad picture of the deep drawing process and illustrated his lecture with slides and exhibits of deep-drawn pans.

Forecasts Engineering Trends

Frank E. P. Griggs, Sales Manager, Canadian Hanson & Van Winkle Co. Ltd., (Left), Who Spoke on "Trends in Engineering" at a Recent Meeting of the Manitoba Chapter, Is Shown Receiving a Gift From J. P. Oswald, Chapter Vice Chairman, After His Speech. (Photograph by Paul Schiffer Studios)

Austin Speculates on Tomorrow's Metals at Utah

Shown at the Speakers' Table at National Officers' Night Meeting of the Utah Chapter Are, From Left: C. L. Parsons, Utah Manufacturers Association; Shirley Richens and Stanley Oxborrow, Scholarship Award Winners; Carl Christensen, Dean, School of Mines and Metallurgy, University of Utah; A. Ray Olpin, President, University of Utah; James B. Austin, the Guest Speaker; Loren J. Westhaver, Columbia-Geneva Steel Division; O. H. Davenport, Linde Air Products Co.; E. Allen Bateman, State Superintendent of Education; Heber Brimley, Columbia-Geneva Steel Division; Frey Dyer, Columbia-Geneva Steel Division; Don Rosenblatt, Eimco Corp.; A. P. Hoelscher, Columbia-Geneva Steel Division; and Jack Jones, Pacific Metals Co., Ltd.

Reported by Don Rosenblatt
Chief Metallurgist, Eimco Corp.

J. B. Austin, director of the research laboratories of United States Steel Corp., presented a stimulating metallurgical picture of the world of tomorrow before the National Officers' Night meeting at Utah.

In his speech, "Metals of Tomorrow", Dr. Austin indicated that a comprehensive appraisal (which he referred to as "an extrapolation of recent trends tempered with chemically pure speculation") of the future of metals would be along the following lines:

1. Iron and steel will enjoy a reasonably safe future. Adjustment of applications will take place with no significant market curtailments.
2. Nickel has a well-assured future, due to its limited availability.
3. Pending the expanding developments of uses for tin, the outlook is not quite as bright as for some of the other principal metals, except lead and zinc, which may be in for stiff competition with some of the light metals.
4. While competition for copper with other metals will increase, the increased consumption of this metal is a fair certainty.
5. The use of platinum and its relation to industrial productivity indicate its continued future as an important metal. Mention was made of the development of rhenium, probably on a considerable scale in the future, to displace partially both platinum and tungsten in certain applications.
6. Titanium and zirconium, the "precocious metals", will have tremendous future potentialities after certain technological difficulties have been surmounted.
7. Radioactive metals and the "transistor" metal germanium are still in the primary stages of development. It would require 40 tons of radioactive material to operate America's 40 million cars and trucks, so atomic power transportation probably won't be available to the public for many years to come.

Dr. Austin closed on an optimistic note, indicating that the prospects for the future look even more glorious than the performance of the past.

Carl Christensen, dean of the school of mines and metallurgy of the University of Utah, presented scholarship awards to three high-school essay contest winners of a competition sponsored jointly by the Utah Manufacturers Association and the Utah Chapter. First prize was awarded to Stanley Oxborrow of Jensen, Utah, for his paper on "Steelmaking", second prize to Dee Clinton Passey of Salt Lake City for his essay on "Aluminum", and third prize to Shirley Duane Richens of Roosevelt, Utah. The contest winners received A.S.M. student memberships. The winner of the first prize, Stanley Oxborrow, made an acceptance speech in which he said that the winning of the contest made him decide to make his career metallurgical engineering.

H. Edward Flanders, chapter secretary, presented certificates to past-chairmen in order of their services, as follows: Fred Dyer, Columbia-Geneva Steel Division; Don Rosenblatt, Eimco Corp.; A. P. Hoelscher, Columbia-Geneva Steel Division; Jack Jones, Pacific Metals Co.; and Robert Prout, Columbia-Geneva Steel Division. He prefaced the presentation with a few remarks about the history of the Chapter.

Explains Classification Techniques for Toolsteels

Reported by A. S. Vince
Royal Canadian Mint

Harold B. Chambers, superintendent of metallurgical services and inspection, Atlas Steels Ltd., presented a lecture on "The Classification and Selection of Toolsteels" at a meeting of the Ottawa Valley Chapter.

Mr. Chambers pointed out that there are about 50 basic types of toolsteel applications which may be classified into six groups from a mechanical point of view. However, such a classification does not offer a good basis for a practical classification of toolsteels because it does not indicate the wear resistance, heat resistance, toughness and heat treating limitations of toolsteels.

A more practical classification, based on chemical and metallurgical properties, was recommended by the speaker because it presents the essential characteristics of the toolsteels. The toolsteels were divided into 12 groups according to their wear-toughness capacities at room and elevated temperatures and their hardening nature. Within a given group the toolsteels were arranged by empirical chemical analyses in order of decreasing wear resistance and increasing toughness.

Hardening of tool-steels was associated with simple, intricate, and very intricate tool and die design. Design factors that change a tool from simple to very intricate were explained.

Details Strip Mill Practice at Ontario

Reported by J. McNichol

Metallographer
Algoma Steel Corp. Ltd.

The Northern Ontario Chapter heard William Rodgers, metallurgical engineer, Republic Steel Corp., speak on "Strip Mill Practice" recently.

Mr. Rodgers noted that there are few differences between a wide strip mill and a smaller mill as far as rolling problems are concerned. Sheet, strip, and skelp made up 38% of the total steel production in the United States in 1947. Mr. Rodgers emphasized points in his talk by comparing two types of flat steel products, based on openhearth practice, rimmed steel and aluminum killed products.

Beginning at the openhearth, Mr. Rodgers traced the formation of sheet and strip through the soaking pits, blooming mills, reheating furnaces, hot rolling mills, and cold mills to the final products. Poor openhearth steel cannot be made into good quality steel in the mills, and for this reason a great deal of care is taken in the openhearth and soaking pits to produce a satisfactory steel surface.

In making drawing quality steels, silicon fouls up the rim and causes blisters in the final cold rolled product. Aluminum additions vary according to the plant and company. One satisfactory practice is to add 2 to 2¼ lb. of notch bar aluminum per ton in the ladle, and 2 lb. of rod aluminum per ton in the molds. The larger the nozzle the better the pouring practice, which, in turn, gives better surface quality to the steel. In soaking pit practice the time required to heat the ingots varies as to the temperatures of the ingots when charged.

Soaking affects surface, scaling, and yield of the product produced. By rolling bottom end first in the blooming mill, yield may be increased up to 4%.

The steel is conditioned when it arrives in the strip mill to remove surface defects. The slabs are either hot scarfed, hand scarfed, or chipped. From a reheating furnace with strict temperature controls, the slabs are rolled into the final product by passing them through a series of 10 separate roll stands. Each stand reduces the slab thickness until at the tenth pass the final hot rolled thickness is obtained. Many of the larger mills in the United States have a furnace capacity of 750 tons per hr.

The speaker also discussed the holding table which controls the finishing temperature of the product; optical pyrometers for measuring temperature of sheet and strip while passing through the mill; X-ray gages for determining thickness of the sheet and strip passing through the mill; coiling strip for shipment; and descalers with water pressure of 2500 psi.

Coiling temperature for rimmed steel is usually from 1350 to 1400°F. This controls the grain size and the physical properties of the final product. Aluminum killed steel is coiled under 1100°F., and is quenched black after the last finishing pass.

A.S.M. Foundation for Education and Research Offers 40 Scholarships

The American Society for Metals Foundation for Education and Research, founded in 1952, has announced completion of plans to distribute 40 scholarships to students of metallurgy in American and Canadian engineering schools.

According to John Chipman, president of the Foundation and head of the department of metallurgy, Massachusetts Institute of Technology, the scholarship grant to metallurgical students is a part of a program which is aimed at stimulating increased enrollment of high-grade students in metallurgical curricula.

The scholarship carries a grant of $400 cash for the undergraduate student selected by the university as being most qualified to carry forward the aims and purposes of the Foundation's program.

Dr. Chipman indicated that the Foundation's objective will be best served if each of the 40 scholarships and awards go to students of metallurgy who have attained their second year of study. However, it is entirely within the authority of the university to make the award to a student other than a sophomore if the head of the university course in metallurgy feels that the objective of the Foundation is thus better served.

The A.S.M. Foundation for Education and Research was established when the Society set aside a fund of $650,000 as a source of income to be used for the advancement of education and research in the field of metals engineering. The Foundation's constitution allows only the expenditure of income from the $650,000 fund. The principal is to remain intact in perpetuity.

Speaker Brings Machining Up-to-Date

The Newly Elected Officers of the Saginaw Valley Chapter Are Shown With E. J. Krabacher, of the Research Department, Cincinnati Milling Machine Co., Who Spoke on "Research and Methods of Machining Metals" at a Recent Meeting. Pictured are, from left: A. A. Moore, new chairman; F. L. Mackin, retiring chairman; Mr. Krabacher; and T. E. Leontis, new vice-chairman

Reported by F. L. Mackin

General Motors Institute of Technology

E. J. Krabacher, of the research department, Cincinnati Milling Machine Co., reported the latest developments in "Research and Methods of Machining Metals" before a recent meeting at Saginaw Valley.

Any machining of metal, whether by broaching, grinding or drilling, involves chip removal. The most efficient metal removal provides a continuous thin chip. Variables in chip formation are caused by changing rake or shear angles and speed of machining.

One of the most significant developments in the field of metal removal is the new method of tool life evaluation using radioactive isotopes. A small piece of tool material is ground so as to have four cutting edges and is then subjected to radiation. A machining operation is performed with the radioactive tool and the resulting chips are used to determine tool life. As the tool abrades away in the machining operation, approximately 98% of the tool material adheres to the chips. Activity of the chips is measured and, by calculation, the amount of tool wear is determined. This method can be used to evaluate cutting fluids, work materials, etc.

Tool life is an important consideration in machining metals. There is an optimum cutting speed at which to machine and there is an optimum feed at various cutting speeds—within this range lies the most efficient and the best machining conditions.

Gives Materials Selection Guide

National Officers Night at Purdue Featured H. B. Knowlton (Second From Left), A.S.M. Trustee and Chief Engineer of Materials Engineering Department, International Harvester Co., Who Discussed "Selecting Material on a Performance Basis". Pictured are, from left: H. J. Bates, technical chairman; Mr. Knowlton; T. J. Hughel, coffee speaker; and C. R. Anderson, chapter chairman. (Photograph by W. F. Bertram, Haynes-Stellite Co.)

Reported by J. M. Hoegfeldt
Haynes Stellite Co.

H. B. Knowlton, A.S.M. trustee, and chief engineer of the materials engineering department, International Harvester Co., discussed "Selecting Material on a Performance Basis" at National Officers Night at Purdue.

Metallurgically, we live in a complicated civilian structure of specifications — sometimes realistic, sometimes fantastic. When alloying elements were plentiful before World War II, material for many applications were over-specified. Designers and metallurgists who used only the few alloys known to them chose materials whose capabilities were well above actual requirements. However, as the need for conservation of strategic materials has become increasingly necessary over the past 15 years, metallurgists have been forced to take a closer look at actual requirements. A good start in conserving materials was taken late in 1941 when the National Emergency steels were designed, mostly by calculation, using only three actual test heats. These steels and other lean materials such as boron steel, are evidence of the great advances which have already been made, but still more work must be done in this direction.

Requirements of automotive materials were given by the speaker, who stated that the most common causes of failure were lack of strength at a critical area, lack of toughness, and undesirable internal stresses.

Tests have been devised to certify the material to be qualified to the desired specification, but often only after testing will it be disclosed what tests and specifications are needed.

Mr. Knowlton discussed recent developments in automotive steels and how occasionally steels will serve satisfactorily when tests predicted failure. Usually some factor was overlooked when specification was written.

Salt Bath Heat Treating Topic at Carolinas Meeting

Reported by Moss V. Davis
Metallurgical Engineer
Western Electric Co., Inc.

John P. Clark, Jr., president of the John P. Clark Co., spoke on "Molten Salt Baths and Practical Heat Treatment" to some 60 members and guests of the Carolinas Chapter on Sustaining Members Night.

Mr. Clark gave a brief history of the evolution of salt baths as a heat treating medium. While the use of salt baths in heat treating dates back many years, only in the last 20 years have the heat treating characteristics of such a large number of salt compositions been widely known and employed. Salts employed in modern salt baths fall roughly into three main classifications: cyanides, chlorides, and nitrates. Salts of varying composition which may be employed in a wide range of useful temperatures are readily available.

Mr. Clark explained some of the advantages of salt bath heat treating and reviewed the basic principles of heat treating as applied to steel. Among the advantages of salt bath heat treating are economy of operation, ease of uniform temperature maintenance (so that distortions are held at a minimum), articles not in contact with atmosphere during treatment, and liquid salt film on article when transferred to quenching medium prevents oxidation, giving scale-free surface after quenching. The advantageous use of salt baths in such isothermal treatments as martempering and austempering was explained and illustrated. Slides of salt baths in operation and examples of many complicated parts which had been heat treated in salt baths without distortion were shown.

Mr. Clark concluded his talk with a brief discussion of safety precautions connected with salt baths. He warned against transferring articles carburized in cyanides into nitrates or mixtures of nitrates and nitrites to quench. Pots previously used for nitrates should not be used later for cyanides or vice versa. Either salt introduced into the other may cause an explosion with probable injury to persons and property. However, he pointed out that an article removed from a cyanide bath could be held several minutes in a neutral chloride bath, following which it might be safely transferred to the nitrate-type bath without danger.

Recent Developments in Titanium Discussed at Philadelphia Meeting

Reported by Charles C. Mathews
J. T. Ryerson & Son, Inc.

At the April meeting of the Philadelphia Chapter, W. E. Lusby, Jr., of E. I. du Pont de Nemours & Co. spoke on "Titanium". He outlined the manufacture of titanium metal sponge, fabrication of titanium, and developments to come.

Production of titanium by the basic magnesium reduction of titanium tetrachloride has increased from about 10 tons in 1948 to an estimated 3000 tons in 1953. One of the biggest production problems is the extreme reactivity of titanium with all gases of the atmosphere and with the materials of construction used in reactors, etc. By far the greatest part of present production is commercially pure titanium as contrasted to titanium alloys.

The two most popular forms in which titanium is now being used are in forgings and as rolled sheets. Ingots can now be cast in weights up to two tons. It is interesting to note that for every pound of rolled sheet that is produced, approximately two pounds of titanium sponge is required. This excessive scrap loss is a big factor in the market price of titanium.

Spot, flash and inert gas fusion welding processes are adaptable to commercially pure titanium, which has a tensile strength of about 70,000 psi., and an annealed hardness of about 56-59 Ra. Major use patterns for this metal are aircraft power plants, airframes, ordnance, marine and chemical equipment. Titanium is now being evaluated in place of stainless on prototypes of the Sabre-jet fighter plane. It is also being used to cover the nacelles of DC-7 commercial airliners.

Dr. Lusby illustrated certain features of his talk with slides and an excellent display of titanium metal tubes, wire, and various other fabricated forms.

Outlines Progress of Research in Ferrous Process Metallurgy

Reported by John J. Cox, Jr.
Metals Research Laboratory
Carnegie Institute of Technology

Members of the Pittsburgh Chapter left the Second Annual Pittsburgh Night meeting with the feeling that the fruits of scientific research are nourishing the steel industry toward greater, more efficient production of higher quality materials. The talk, "Recent Contributions of Research to Ferrous Process Metallurgy", was presented by W. O. Philbrook, associate professor of metallurgy and member of the staff of the Metals Research Laboratory, Carnegie Institute of Technology.

Prof. Philbrook chose the iron blast furnace to illustrate the application of engineering principles and research in gas flow, heat transfer and thermochemistry, and the principles of dimensional similitude to studies on the factors affecting the rate of production of pig iron. Analysis of the process indicates that the characteristics of the flow of gas upwards through the charge is probably the factor which controls the rate of production.

An equation has been derived that shows the qualitative and semiquantitative effects of charging and operating variables on production rates and efficiencies. The role of coke as a creator of charge permeability was shown to be of paramount importance in affecting the gas flow pattern. Scale model investigations and comparisons with chemical engineering data on liquid-gas contacting towers have been fruitful in yielding new insight into the conditions within the blast furnace.

The second portion of the lecture was devoted to the application of the principles of physical chemistry to blast furnace slag control, and in particular to the ever increasing problem of the desulfurization of pig iron. Prof. Philbrook emphasized that the kinetics and mechanistics of the slag-metal reactions are more important from a practical standpoint than equilibrium studies, since time is the important variable. Manganese and aluminum can greatly increase the rate of the desulfurization reaction, and all that remains is to find methods of making these additions to the metal. If separate desulfurization treatments are deemed necessary by the increased use of high sulfur coke, additions can be made more easily.

In conclusion, Mr. Philbrook outlined the new process metallurgy approach, that of breaking down complicated phenomena into unit processes such as those used by the chemical engineers. He stressed that the field is young in research and offers unlimited opportunities to men who desire inspiration that will point towards a more widespread understanding of the science of iron and steel production.

At the conclusion of the discussion period, Prof. Philbrook was presented with a certificate by George M. Snyder, chapter chairman, in recognition of his being the Second Annual Pittsburgh Night Lecturer.

Cites Advances in Turbine Materials

R. H. Thielemann, Pratt and Whitney Aircraft Corp., Spoke Before the Oak Ridge Chapter on "Aircraft Gas Turbine Materials". Shown above are, from left: W. D. Manly, vice-chairman; Mr. Thielemann; A. Levy, Pratt and Whitney Aircraft Corp., on loan to Oak Ridge National Laboratory; and R. B. Oliver, technical chairman. Mr. Manly and Mr. Oliver are both employed by the Oak Ridge National Laboratory, Metallurgical Division

Reported by James L. Scott
Research Assistant
University of Tennessee

The Oak Ridge Chapter heard R. H. Thielemann, development metallurgist, Pratt & Whitney Aircraft Corp., speak recently on "Aircraft Gas Turbine Materials".

Mr. Thielemann said that the United States has now had 10 years of experience with jet engines. Over these years the power of the jet engine has increased about 1000 lb. a year from the earliest models to the modern engines in the 10,000 lb. thrust class. With ever-increasing power demands, the problem of providing satisfactory materials for construction is becoming increasingly severe.

The modern jet engine represents the ultimate in specialized requirements for its various components. After ten years experience with it, the use of critical high-temperature alloys still appears to be the key to jet engine performance. The future success of the jet engine depends upon the ability of newly developed superalloys to withstand the unusual demands. It follows that new, more powerful engines will require greater quantities of the critical alloying elements for their construction.

The high-strength, high-temperature alloys are required in sheet form for burner liners, afterburners, and exhaust cones. For these applications, high fatigue strength, resistance to buckling, and oxidation resistance at high temperatures are necessary. Large forgings of high-temperature alloys are required for turbine disks. The processing of large pieces of these alloys presents a problem in many applications. Every effort must be made to process large forgings and castings of these alloys as closely to finished size as possible so as to reduce the amount of metal required.

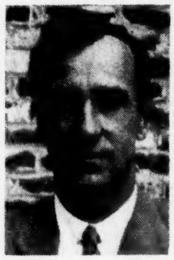
The most critical requirements in a jet engine are met in blade materials. These alloys must be able to withstand high stresses at temperatures up to 1600° F. They must not be notch sensitive because nicks are created by the various foreign materials which pass through a jet engine, such as rocks, pieces of metal and flak. Both nickel and cobalt-base alloys are used for turbine blades, but the maximum high-temperature properties that can be obtained with alloys made by conventional methods appears to be in sight. Molybdenum-base alloys and carbide cermets have proved to be unsatisfactory thus far, due to rapid oxidation and brittleness, respectively.

Because of the weight-saving potential, titanium alloys are being developed for compressor components. These alloys must also have high creep and fatigue strengths before they can successfully replace steel. Mr. Thielemann stated that the excellent resistance of titanium alloys to corrosion and stress cracking makes them additionally attractive for jet engine construction.

Meet Your Chapter Chairman

George D. Dolch

Blake D. Mills, Jr.



Eugene Olcott

J. R. Bateman

CALUMET

JAMES R. BATEMAN, chief metallurgist, Standard Forgings Corp., was born 38 years ago in East Chicago, Ind., where he received his early education. He is proud of the academic rating of his alma-mater, Purdue University, from which he received his B.S.Ch.E. degree in 1938. He is married, and lives in Highland, Ind., with his wife, Mildred, six year old son, Douglas, and blond cocker spaniel.

Jim started working at Inland Steel Co. in 1933, and worked there during vacations until his graduation. In 1937 he joined the metallurgical department at Inland. In 1944 he accepted a position with Standard Forgings Corp.

Jim's favorite recreation is swinging a golf club. Other activities of a civic nature which occupy his attention are the P.T.A., Civilian Defense. He is a Trustee on the Town Board at Highland, and is affiliated with the United Presbyterian Church.

WASHINGTON

EUGENE (GENE) OLCOTT, a native of St. Louis, Mo., graduated from the Missouri School of Mines and Metallurgy in 1940. After graduation he was employed first by the Bethlehem Steel Co., and then by General Electric Co., where he specialized in heat resisting materials. He is currently employed as the Bureau of Ships high-temperature metallurgist, and is concerned with development of materials for naval propulsion machinery.

Gene's favorite form of recreation is outdoor sports, with particular emphasis on skiing in winter and camping in summer. His most creative hobby is amateur building; he built his own home in Falls Church, Va., where he lives with his wife and young son and daughter.

Gene has served on several government and A.S.T.M. committees relative to heat resisting materials, and on the executive committee of the Eastern New York Chapter A.S.M. (1943-45), and the executive committee of the Washington Chapter A.S.M. (1948 to present).

PUGET SOUND

BLAKE D.MILLS, JR., was born in Seattle, Wash., in 1912. He graduated from the University of Washington in 1934 with B.S. degrees in mechanical and electrical engineering. He obtained an M.S. degree in mechanical engineering from Massachusetts Institute of Technology in 1935, and spent the next year as a test engineer with General Electric Co., Schenectady. For the next five years he was a mechanical engineering instructor at M.I.T., and during the war years, from 1941 to 1946, he served with the Navy's Bureau of Ordnance. After release as a commander from the Navy, he joined the mechanical engineering faculty of the University of Washington, where he is a professor of mechanical engineering.

Blake's wife, Dorothy, is a native of Philadelphia. His parents were pioneers in the Pacific Northwest, having been born in the vicinity of Seattle before Washington became a state.

He has a son, five, and a daughter, two. His hobbies include handball and radio (has had ham operator's license for 15 years). He is currently writing a textbook on engineering materials, and his publications have appeared in various scientific and technical periodicals.

Blake is a member of the local chapter of the A.S.M.E., and is an executive officer of the Naval Research Reserve Unit in his territory.

THE CAROLINAS

ALBERT R. FAIRCHILD, JR., first chairman and the organizer of the Carolinas Chapter, was born in Spokane, Wash., in 1913. His father's work in electrical engineering moved the family all over the country but mostly around Philadelphia.

Al went to Duke University where his main interest was football. Because of knee injuries and lack of money, he stayed out one year, during which he fell in love with hot metal in the heat treating room of the Standard Pressed Steel Co. He returned to school, completing work for his degree in Feb., 1937, and at the same time courting a graduate student, Nell Trivette of Boone, N.C., whom he married in May 1938.

The first three years after graduation were spent in the heat treat department of Midvale Steel Co., followed by a year as night foreman of heat treat at Standard Pressed Steel Co. During World War II Al was in charge of the heat treat and tool forging department at New York Shipbuilding Corp. He was a member of the Philadelphia chapter, active as chairman of various committees and served as a director.

Al continued his scholastic work at night, taking technical and graduate work at Temple University and graduate work in mechanical engineering and physics at the University of Pennsylvania. He also taught mathematics and elementary metallurgy at Camden County Vocational School. After the war, Al went to the Metlab Co. in Philadelphia as plant superintendent. In Oct., 1948, Al, Nell, and their children, Albert and William, returned to Nell's home state where they are now "Tar Heels", living in Winston-Salem. Al is now consulting metallurgist with the Western Electric Co. In recent months he realized a four-year's ambition in organizing the newest chapter of A.S.M., The Carolinas. He is an active member of the Winston-Salem Engineers Club and of the Southern Association of Sciences and Industry. He is also currently serving as secretary to the Piedmont Chapter, American Society of Tool Engineers, vice-president of the Winston-Salem Section Council of Western Electric Technical Employees, treasurer and past president of the Forsythe County Humane Society, and in his spare time publishes the "Trestleboard" for Pioneer Lodge A.F. and A.M. He was an American Conferee at the World Metallurgical Congress.

A. R. Fairchild

CLEVELAND

GEORGE D. DOLCH, JR., was born in Cleveland in 1909. He graduated from Case School of Applied Science (now Case Institute of Technology) with the degree of B.S. in metallurgical engineering in 1931 and in 1932 a M.S. degree in metallurgical engineering was conferred on him by Case.

George is married and it the father of one son, David. Hobbies have been rather limited, but color photography, travel, and his associations with his son in outdoor activities hold the most appeal.

In 1934 he joined Thompson Products, Inc., Cleveland. He is currently chief metallurgist of their Tapco Divisions, engaged in producing jet and reciprocating engine components.

George has been an A.S.M. member for 23 years and recently served as a members of the Minerals and Metals Advisory Committee on Naval Aircraft Gun Turrets. He is a member of S.A.E., A.S.T.M., and is a registered professional engineer in Ohio.

Panel on Heat Treatment of Alloy Steels

Members Participating in the Panel on "Production Heat Treatment of Alloy Steels" Held by the Canton-Massillon Chapter Included, From Left: M. Tomko, Metallurgist, Lakeside Steel Improvement Co.; G. D. Dolch, Chief Metallurgist, Thompson Aircraft Products, Inc.; W. W. Leffler, Superintendent, Heat Treating and Bar Finishing, Central Alloy District, Republic Steel Corp.; H. A. Tobey, General Superintendent, Timken Roller Bearing Co.; R. W. Roush, Materials Engineer, Timken-Detroit Axle Co.; R. J. Perrine, Metallurgist, Electric Furnace Co.; and J. Welchner, Metallurgist, Timken Roller Bearing Co. (Photo by W. E. Ellis)

Reported by J. M. Brunner
Laboratory Metallurgist
Republic Steel Corp.

The Canton-Massillon Chapter recently held a panel discussion on "Production Heat Treating of Alloy Steels". The moderator was Henry A. Tobey, general superintendent, Timken Roller Bearing Co. Panel members were G. D. Dolch, representing aircraft heat treating; W. W. Leffler, representing steel mill bar heat treating; R. J. Perrine, representing heat treating equipment; Michael Tomko, representing commercial heat treating; R. W. Roush, representing automotive heat treating; and J. Welchner, representing forging heat treating.

Mr. Tobey was well supplied with heat treating questions which had been submitted prior to the meeting. This meeting was the third in an annual series of panel discussions. The past two have been on "Melting of Alloy Steels" and "Rolling and Forging of Alloy Steels".

Problems discussed by the panel were the control of residual stresses, effect of boron on large sections, causes of quench cracking and corrective measures, modern improvements of heat treating equipment, distortion in gears and brazed assemblies, practicality of isothermal annealing from a commercial viewpoint, advantages and disadvantages of special quenching oils, carbon restoration, and cycles for the elimination of flaking.

That there is strong interest in heat treatment in the Canton-Massillon district was evidenced by the large attendance at this panel meeting, and by the Chapter's recently concluded series of educational lectures on the "Principles of Heat Treatment" in which over 250 individuals participated.

Importance of Die Casting Process Related at Syracuse

Reported by W. C. Wheadon
Director, Institute of Industrial Research
Syracuse University

Highlights of the history of "Die Casting" in this country, and present-day techniques and applications were presented to the Syracuse Chapter by S. E. Maxon of the Metal Division, New Jersey Zinc Co.

Of special interest to the group were the references made by Mr. Maxon to the pioneering work done in die-casting development by the H. H. Franklin Co. and the Van Wagner Co., the latter being the predecessor of the present Precision Castings Co.

Mr. Maxon showed a color film of modern practice in a large die-casting plant and later enlarged upon points of interest shown in the film. While magnesium and copper alloys are used extensively as die castings, by far the greatest tonnage is represented by zinc and aluminum alloys. It was pointed out that die life is a very important economic consideration in the industry. While metals of relatively high melting points, such as the popular copper alloys, may be readily die cast, the wear and tear on the dies are high, compared to zinc and aluminum alloys.

Die casting is not only a rapid and economical process for forming intricate parts, but also may be the only feasible means of producing complicated designs. Close tolerances, excellent machine finish and sharp reproduction are characteristic of good die-casting practice. Because of the method used to introduce the molten metal in the die, little dross is encountered and the casting is therefore relatively free from metallurgical defects.

Intricate parts made by the die-casting process, furnished by local industries, were on display at the meeting. Mr. Maxon commented on several of these, pointing out the difficulties that would be encountered in other methods of production.

In concluding his talk, Mr. Maxon forecast an even greater use of die casting in the future. This expansion will be greatly aided by improvements in die materials, especially as regards the use of the process for relatively high melting alloys.

Utah Chapter Completes Heat Treating Course

"Principles of Heat Treatment of Metals and Alloys" was the subject of the educational series of six lectures recently completed by the Utah Chapter of the American Society for Metals.

H. Edward Flanders, metallurgical department, University of Utah, presented the first five lectures, and Don Rosenblatt, chief metallurgist, American Foundry and Machine Co., conducted a discussion of practical problems during the last lecture.

The text, Heat Treatment of Metallurgical Products", by Albert Portevin, supplemented the material presented by Dr. Flanders in his series of talks.

Austin Speaks at Los Alamos

Reported by R. O. Elliott
Los Alamos Scientific Laboratory

"Magnification in Time" was the subject of a talk delivered by James B. Austin, director of research, U. S. Steel Corp., and A.S.M. vice-president, before the Los Alamos Chapter meeting in March.

As this report was covered fully in the April issue (p. 4) of *Metals Review,* it will not be reviewed here.

A.S.M. Members' Names Added to Quarter Century Club Roster

The following A.S.M. members have been awarded honorary certificates commemorating 25 years consecutive membership in the Society:

Baltimore Chapter—Alexander L. Feild, N. N. Tilley.

Birmingham Chapter—R. L. Farabee.

Boston Chapter—P. P. Bicknell, L. Geerts, Massachusetts Institute of Technology, B. K. Thorogood.

Buffalo Chapter — Bethlehem Steel Co., Buffalo Bolt Co., V. V. Efimoff, Lewis F. Gadbois, Pratt & Letchworth Co., Republic Steel Corp., S. F. Urban, Wickwire Spencer Steel Co., Worthington Corp.

Calumet Chapter—R. W. Dickson, G. A. Lilliequist.

Canton-Massillon Chapter—K. Bert Bowman, Ernest Lancashire.

Cedar Rapids Chapter—K. E. Henrikson.

Chicago Chapter — Anderson-Shumaker Co., P. Allerton Cushman, A. E. Dentler, K. L. Ernst, Harold L. Geiger, Fritz Helmold, S. L. Ingersoll, D. W. McDowell, George Messersmith, H. H. Morgan, E. L. Roff, Jr., A. W. Sikes.

Cincinnati Chapter—R. E. LeBlond, Mitchell Steel Co.

Cleveland Chapter—H. D. Bubb, Jr., M. L. Burchfield, H. P. Coats, A. J. Gillespie, N. P. Goss, A. A. Gould, F. W. Krebs, L. V. Prior, C. A. Prochaska, H. G. Roodhuyzen, S. H. Smith.

Columbus Chapter — Walter D. Kramer, C. E. Sims.

Dayton Chapter—Louis S. Jacobson, Ture T. Oberg.

Detroit Chapter—T. A. Benton, J. R. Hoven, Michigan Consolidated Gas Co., E. L. Morrison, Harold Stark, White Star-Ohio Division, Socony-Vacuum Oil Co., Inc.

Eastern New York Chapter—J. F. Eckel, Floyd C. Kelley, Lyall Zickrick.

Golden Gate Chapter—H. P. Etter, L. M. Martin, George A. Nelson.

Hartford Chapter—P. C. Badgley, Wallace Barnes Co., V. V. Blacker.

Indianapolis Chapter—F. S. Badger, Jr., H. H. Lurie.

Lehigh Valley Chapter—J. H. Bateman, Birdsboro Steel Foundry and Machine Co., A. C. Chamberlin, Consumers Gas Co., Lebanon Steel Foundry, D. W. Murphy, L. H. Winkler.

Los Angeles Chapter—F. H. Currie, W. A. DeRidder, A. J. Peverley, W. A. S. Wright.

Mahoning Valley Chapter — J. G. Green.

Minnesota Chapter—Arthur C. Forsyth, H. S. Jerabek.

Montreal Chapter—R. W. Bartram, Ltd., W. J. Brown, A. J. Goodenough, Charles E. Herd, H. Jeserick, Joseph Komaroff, McRobert Spring Service, Harold J. Roast.

New Haven Chapter—A. P. Bliss, John C. Bradley, G. R. Bunting, F .T. Quinlan, Waterbury Farrel Foundry and Machine Co.

New Jersey Chapter—Leo A. Bauer, W. B. Clary, J. A. Doyle, H. H. Rotert.

New York Chapter—E. J. Bothwell, De-Laval Separator Co., M. Gensamer, Otto H. Henry, Carl H. Loeb, Jr., G. A. Lux, E. P. Polushkin, Ralph M. Sample, H. E. Sanson, Jr., Wilson Mechanical Instrument Division, American Chain and Cable Co., Inc.

Northwest Pennsylvania Chapter—G. E. Leonard.

Ontario Chapter—J. B. Burk, Burlington Steel Co., Ltd., W. G. Cole, Owen W. Ellis, Fred A. Loosley, W. G. Milne, Norton Co. of Canada, Ltd.

Oregon Chapter—S. H. Graf.

Ottawa Valley Chapter—Henry H. Bleakney.

Peoria Chapter—R. A. Furrer.

Philadelphia Chapter — Harold E. Trent, H. C. Bostwick, C. H. Greenall, Edward Hitzeroth, A. L. Jamieson, Jr., Karl Lang, R. W. E. Leiter, C. L. Warwick, J. Frank White, Ernest Wollin.

Pittsburgh Chapter — Gilbert E. Doan, J. R. Eckley, D. L. Edlund, Francis A. Egan, C. R. Francis, S. A. Fronek, W. G. Hassel, H. G. Johnstin, Owen K. Parmiter, Philip Schane, Jr., B. B. Wescott, L. A. Willey.

Puget Sound Chapter—James Allison.

Purdue Chapter—G. A. Goepfert.

Rhode Island Chapter—C. I. Hayes, Inc., H. S. Swenson, George Tarring.

Rochester Chapter — L. S. McPheters.

Rockford Chapter—National Lock Co.

Rocky Mountain Chapter—Gilbert C. Hoover.

Saginaw Valley Chapter — E. G. Peckham.

San Diego Chapter—R. W. Bowers.

Southern Tier Chapter — G. M. Thrasher.

Springfield Chapter — Chapman Valve Manufacturing Co., N. B. Ellison, M. K. Epstein, A. L. Shields.

Syracuse Chapter—C. V. Johnson, F. A. Porter.

Texas Chapter—H. M. Wilten.

Tri-City Chapter—International Harvester Co.

Warren Chapter—E. W. Husemann.

Washington Chapter—C. E. Meisener, H. B. Romine, T. L. Stivers.

West Michigan Chapter — T. M. Snyder.

Worcester Chapter—M. G. Werme.

York Chapter—G. E. Shubrooks.

International Chapter—Fred Atkinson, A. P. M. Fleming, S. L. Sonnerdale.

Explains Hot Extrusion of Metals at Detroit Meeting

Reported by Donald N. Frey

Scientific Laboratory, Ford Motor Co.

The March meeting of the Detroit Chapter featured a talk on "Hot Extrusion of Metals by the Eugene-Sejournet Process", by S. O. Evans, superintendent of extrusion, Babcock and Wilcox Co.

Mr. Evans outlined the general principles of hot metal extrusion—namely, the pushing of a slug of metal through a die or dies to give the desired cross section. One of the great difficulties with steel extrusion has been the proper lubrication of the die to avoid seizing and galling, and consequently excessive die wear or breakage. The main contribution of the Sejournet process for steel is use of glass as lubricant on both the slug to be extruded and within the die chamber.

Mr. Evans continued by outlining and illustrating the step for extrusion of steel tubes at Babcock and Wilcox. First a billet of the desired steel is heated in a rotary hearth furnace and then pierced in a vertical press. The pierced billet is reheated in a salt bath and rolled down an inclined plane whereupon it picks up the glass lubricant on the cylindrical surface. The billet is then placed within the die chamber of the extrusion press and behind a glass wool annulus previously inserted. Pressure is applied and the extruded tube runs out into a runout table where it is cut to length and cooled.

New York Students Hear One Theory of Ship Fracture

Reported by I. M. Hymes

International Business Machine Corp.

Twenty-four students from schools in the Metropolitan area were represented at the March meeting of the New York Chapter. Six of the students were prize winners in the recent contest sponsored by the A.S.M. Chapter Educational Committee.

The topic of the evening was "Low-Temperature Properties of Structures", by E. M. MacCutcheon of the U. S. Navy Bureau of Ships. After two films and some excellent slides showing ship failures in which vessels fractured amidship, Mr. MacCutcheon advanced his concept of this type failure. As a result of plotting the absorption energy of the materials in a number of failures, he proposed a Fracture Factor (F.F.) which would be equal to the elastic modulus (E) of the material, multiplied by the energy absorption factor (u_a), both divided by the square of the design stress (S_n). Symbolically this is $F.F. = E\,u_a \div S_n^2$.

An interesting point was the speed of crack propagation, found to be of the order of 6000 ft. per sec.

Describes Behavior Of Gases in Metals

Reported by P. H. Parker
Continental Foundry & Machine Co.

At the March meeting of the Calumet Chapter, D. J. Carney discussed the "Behavior of Gases in Liquid Iron and Steel". He covered the solubility and chemical activity of oxygen, nitrogen, and hydrogen in molten iron and steel, as affected by increasing amounts of alloying elements and impurities.

Dr. Carney, who is chief development metallurgist, South Chicago Works, U. S. Steel Corp., pointed out that approach to equilibrium solubility of any of these gases is materially affected by the pressure of the gas from the surface medium, such as the various types of slags and atmospheres attendant to the several steelmaking practices.

Solubility of oxygen is decreased by increasing amounts of aluminum, silicon, carbon, vanadium, chromium, and manganese, in that order. Carbon, however, does become more effective than silicon as the amounts exceed 0.30 to 0.40%.

Solubility is only one of the factors concerned, and the influence of alloys on the chemical activity of the dissolved gases should not be overooked. For instance, while chromium and vanadium are not very effective deoxidizers, they do decrease the chemical activity of the oxygen in solution.

The solubility of nitrogen in the solid gamma and delta phases, as well as the liquid phase, was discussed. In the solid phase, delta iron has a lower nitrogen solubility than gamma iron. This, Dr. Carney stated, is the cause for differences in gas evolution from steel of the same nitrogen level when it solidifies.

The chemical activity of dissolved nitrogen is materially influenced by the presence of alloys. Those alloys which combine with iron increase its activity, while elements which combine with nitrogen decrease it. Vanadium, chromium, silicon and reducing atmospheres increase the rate of solution of nitrogen. Phosphorus, carbon, oxygen, and oxidizing atmospheres decrease the rate of nitrogen solution.

The major source of hydrogen in steel is water vapor. Its elimination is costly because it involves the use of long cooling cycles.

Increasing amounts of titanium and tantalum increase the solubility of hydrogen in liquid iron and steel, while elements such as columbium and silicon have the opposite effect. As for chemical activity, however, alloys which increase its solubility tend to decrease its chemical activity, while silicon tends to increase it. The greatest influence on hydrogen absorption is the oxygen level in the steel. Too often a heat, in which the hydrogen has been well worked out and then deoxidized, absorbs hydrogen like a sponge from such things as damp runners and ladles.

Japanese Papers Available

The Iron and Steel Institute of Japan has announced the publication of English abstracts of articles published in 1951 issues of its *Journal*. About 100 copies of these abstracts will be available for distribution among interested organizations in the U. S. Requests for copies should be sent direct to the Institute at the following address:

Editorial Department
The Iron and Steel Institute of Japan
(Nippon Tekko Kyokai)
Naka-14-gokan,
10 Marunouchi-2-chome, Chiyodaku
Tokyo, Japan

Tatnall at Penn State

Reported by Walter Showak
Pennsylvania State College

Francis G. Tatnall, manager of testing research, Baldwin-Lima-Hamilton Corp., spoke on "New Testing Tools and Methods" at the April meeting of the Penn State Chapter.

Texas Hear LaQue on Heat Treating

Reported by Joe B. Marx
Sheffield Steel Corp.

F. L. LaQue

F. L. LaQue, who is in charge of the Corrosion Engineering Section, Development and Research Division of the International Nickel Co., addressed a joint meeting of the Texas Chapter A.S.M. and the National Association of Corrosion Engineers. The title of Mr. LaQue's lecture was "Effects of Heat Treatment of Metals on Their Resistance to Corrosion".

Mr. LaQue's paper contained many interesting slides, which were discussed at some length. A few of the slides were:

1. "Effect of Tempering Temperature on Corrosion of 0.87 C Steel in 1% H_2SO_4". The greatest corrosion occurs on this steel when it has been tempered at 300° C. With ductile cast iron, annealed, ferritic structures have the best resistance to corrosion by acids. Steel with a lamellar pearlitic structure will often withstand corrosion better than a fine grained pearlitic structure in environments in which resistance to corrosion depends on the adherence of protective rusts or scales.

2. Oxide scales that are formed above the critical temperatures of steels which develop higher potentials than scales formed at lower temperatures, thus accelerating galvanic action between the scale and the steel during pickling so as to cause pickle pitting.

3. "Relationship Between the Area of Bare Metal and the Depth of Attack of Partially Descaled Steel". The specimens were immersed in salt water for four months. As a result of this and similar experiments, the U. S. Navy now uses only descaled steel for its vessels.

4. Machined surfaces of nitrided steels which were found to suffer localized corrosion that did not occur with similar machined surfaces of carburized steels when exposed in sea water. The machining was done before nitriding or carburizing.

5. Following certain combinations of time and temperature, stainless steels can lose their resistance to corrosion. By including certain stabilizing elements, such as columbium and titanium, and with the proper heat treatment, carbon will combine with these elements to form carbides. The carbides formed help prevent intergranular corrosion.

Mr. LaQue described the boiling HNO_3 test and stated that this test requires careful interpretation in that a stainless steel that exhibits considerable weight loss or intergranular corrosion in boiling HNO_3 will not necessarily react the same under other corrosive conditions.

Mr. LaQue also stated that tests with welded specimens must be viewed with caution because of the variation in welders' techniques and effects of geometry and mass on thermal gradients in fabricated structures.

Mr. LaQue believes that too much emphasis is often put on the effect of stress on the rate of corrosion. A slide was shown that substantiated his reasoning. Where metal had not been stressed beyond the elastic limit, the rate of corrosion was relatively the same as that of unstressed metal. However, if the metal is stressed into the plastic zone, and the normal protective film on the metal is broken, the rate of corrosion is then considerably increased.

New York Past Chairmen Hear Averbach

Past Chairmen of the New York Chapter Who Heard B. L. Averbach of Massachusetts Institute of Technology Speak on "Dimensional Stability of Steels" Are, From Left, Standing: J. J. Preisler; W. C. Mearns; A. R. Strader; T. D. Parker; and J. W. Sands. Seated are: E. M. Wise; Sam Tour; A. B. Kinzel; and J. S. Vanick

Reported by I. M. Hymes
International Business Machine Corp.

Members present at Past Chairmen's Night of the New York Chapter heard B. L. Averbach of Massachusetts Institute of Technology give a talk on the "Dimensional Stability of Steels".

Dimensional stability of a heat treated steel depends on the variation of cooling rates, depending on cross sectional area, the presence of retained austenite, and the aging or long-time decomposition of retained austenite.

Since the retained austenite shrinks on cooling and the martensite formed represents an increased volume, there has to be a balance for dimensional stability. Stability is further upset by aging or decomposition of the retained austenite over a period of time.

While the conclusion drawn from Dr. Averbach's talk is that there is no true nondeforming steel, his explanation of the causes and processes of dimensional instability permit an intelligent approach to the problem.

Opens New Metal Plant

The George Sall Metal Co., Inc., recently opened a new metal plant in Philadelphia for the manufacture of nonferrous metal ingots from scrap materials. The plant, which is streamlined for greatest efficiency of all operations, is divided into separate sections for brass, lead, zinc and aluminum smelting operations.

Educational Course at Puget Sound Conducted on Open Discussion Basis

Reported by H. L. Southworth
Boeing Airplane Co.

The first seminar of the Puget Sound Chapter's 1953 educational program ended with acclaim for the new method of presentation. Deviating from previous practice, the sessions are being conducted as open discussions. A moderator, highly qualified in the subject, introduces, defines, and briefly discusses the topic of the seminar. After this introduction, the progress of the session develops from audience participation. In this manner, recent developments, problems and experiences receive considerable attention.

This type of program was adopted by J. F. Baisch and Mandel Minsk, co-chairmen of the Educational Committee, to provide an educational program more closely meeting the needs of those who attend.

Topics for the seminars were previously determined by a poll. The enthusiastic participation obtained in the first seminars on "High Temperature Materials" indicated a highly successful program for the year.

William L. Slosson, supervisor of material and metallurgy, Industrial Products Division, Boeing Airplane Co., presided as moderator for the first session and the audience greatly benefited from his experience in the development of the Boeing Model 502 gas turbine engine. Discussion of "High Temperature Materials" was restricted to those employed above 1000° F. and covered physical properties of such materials, considerations in design, limitations of available design information, fabrication problems and trends towards use of ceramic materials. The importance of development and use of low alloy materials in view of present and future shortages of strategic alloying materials was stressed.

Twenty Years Ago

(The Stainless Era)
Headlines From *Metals Review*
March 1933

"Talk on Stainless Stirs Discussion—Over 300 Hear E. C. Smith at Pittsburgh in February".

"Tells Worcester How Ford Uses the Stainless Steels—J. L. McCloud Technical Speaker"

"700 Attend Joint Stainless Meeting—Philadelphia Meeting Stresses Architectural Uses"

"J. P. Gill Tells York of Early Work in Stainless Metals"

"Explains ways of Making Stainless—W. B. Arness Speaker at Baltimore"

—20—

"1933 Metal Congress and Exposition to be held in Detroit the week of Oct. 2-6. Directors fix date at recent meeting; show will be at Convention Hall, headquarters at Statler."

Pittsburgh Young Fellows Hear Aluminum History

Reported by A. E. Wiehe

Metallurgist
Gulf Research and Development Co.

About 350 regular and student members turned out for an enjoyable and instructive evening at the annual "Young Fellows Night" event held by the Pittsburgh Chapter.

Conrad F. Nagel, Jr., vice-president, Aluminum Co. of America, the speaker of the evening, presented a talk on "Major Technical Problems of the Aluminum Industry". He touched briefly on the early history of the aluminum industry and on the part which ALCOA has played in its growth and development. He brought sharply into focus the economic aspects of the metallurgy of aluminum and how the Hall process has made possible the widespread use of this metal today. It has constantly been necessary for the Aluminum Co. to engage in new enterprises to demonstrate uses for the product and to promote education of the public to realize the applicability of the metal in many fields. Mr. Nagel pointed out several ventures which his company had gotten into and out of again after new uses had been successfully demonstrated. Even as late as World War II, the full possibilities of the metal had not yet been realized. When the government-sponsored aluminum plants suddenly stopped production of military materiel after the war, a huge excess of capacity for producing aluminum suddenly became available for civilian production and it was absorbed almost immediately. The result of the wartime use of aluminum served to further stimulate new uses for the metal and today the production of aluminum is five times that of 1941.

In his closing remarks, Mr. Nagel mentioned two very serious problems facing the aluminum industry today. One of these is the maintenance of adequate supplies of electrical power for the production of aluminum. The other is the alarming shortage of young engineers, expected to be especially critical during the next two years. The aluminum industry has had to depend largely on research for progress and active development, so the latter problem is a serious one.

Gives Important Factors In Deep Drawing Steels

Reported by Philip Pearson

Metallurgist, Fafnir Bearing Co.

John K. Boll, Jr., chief metallurgist of the Follansbee Steel Corp., gave an excellent description of "The Deep Drawing of Carbon Steel" before the Hartford Chapter.

The important property in deep drawing steel is the tensile strength, which should be about 55,000 psi., with elongation of 30% or better. Steel with a higher tensile strength lacks the ductility necessary for deep drawing; steel with a lower tensile strength does not have the toughness to withstand the sharp, fast blows of the drawing operation.

Mr. Boll reviewed steel manufacuring processes, pointing out that control of residual elements, cropping and surface inspection, rigidly controlled pickling, and carefully controlled annealing are all necessary to achieve the correct properties for deep drawing. Proper elongation is also a very important factor in drawing quality steel. He also reviewed metallographic and mechanical methods of testing drawing steel.

The deep drawing operation was explained and illustrated by showing the steps in making navy gas-mask cannisters.

Battelle Offers Technical Information Service

A new technological information service has been established at Battelle Memorial Institute, Columbus, Ohio. The service is aimed at assisting science and industry in tapping published knowledge. Finding out "what has gone before" is the obvious question a good research man must answer when he undertakes a study. With an estimated 60 million pages of technical matter being published each year, this has become a herculean task.

The new service will couple appropriate use of improved manual and machine documentation techniques with long experience in the gathering and organization of research data. It will include the preparation of bibliographies and coding and classification systems. Where required, the Battelle Memorial Institute will undertake development of information-processing equipment.

Since 1944 Battelle has prepared the material for the A.S.M. Review of Current Metal Literature appearing monthly in *Metals Review*. Just off the press is an extensive bibliography on titanium technology compiled for Watertown Arsenal. For the Wright Air Development Center, Battelle is currently developing a machine system for accepting, storing, and searching engineering data on electronic components.

All the latest developments for the scientific processing of information will be brought to bear on the work, including standard business machine punched-card equipment, xeroradiography, microfilming, and pertinent electronic devices. A continuing study will be made on ways and means to improve already existing techniques for the processing of technical information.

Battelle staff members assigned to the new service include Robert C. McMaster, supervisor of electrical engineering research, Iver Igelsrud, technical librarian, Roger L. Merrill, and Alvin T. Maierson.

Chapter Yearbooks Available

All local chapter secretaries of the American Society for Metals have on hand the yearbooks of most of the other chapters. A.S.M. members are at liberty to request the addresses of members and sustaining member companies from their chapter secretaries if the information is available.

Ladies Honored at Worcester

Vera Green, Assistant Treasurer, Secretary, and Member of the Board of Directors of Botwinik, Machine Tool Manufacturers, Spoke on "The Hand That Rocks the Cradle" at the April Meeting of the Worcester Chapter. With Mrs. Green is Wendell J. Johnson, Massachusetts Steel Treating Corp., Chapter Chairman. (Reported by C. Weston Russell, Wyman-Gordon Co.)

From the Metal Showman

SOLOMON had a cinch. He had only a 1000 wives to worry about keeping and there is evidence that he had quite a lot of assistance in that project.

Right now, from the way exhibit area space has been taken up for the Cleveland Show next October and from the inquiries piling up for preferred hotel space, there's sure to be trouble descending on the shoulders of the men named to the Housing Committee.

Cleveland has some fine hotels. It has some big and comfortable hotels in its surburban areas. But it doesn't look like everybody who wants rooms in the downtown area is going to be able to get them.

The Housing Committee meets first about mid-June. It is made up of a couple of men from each of the sponsoring Societies. At this first meeting the Committee looks over the reservation requests and the hotel availabilities—and wishes it had never volunteered for the job. That's because there are never enough rooms to meet all the demand.

However, being earnest and conscientious gentlemen, the Committee tackles the job. It becomes readily apparent that what will be needed is an equitable pattern of assignment to all comers, regardless of who they are or how long they've been exhibiting at the Big Metal Show or how much space they've bought.

The Housing Committee, fortunately for its members, does not concern itself with individual reservations from exhibitors or others. It is only empowered to establish policy by which individual requests will be handled.

Add to the exhibitors and visitors asking for preferred room space, the outfits who want to put on continuous entertainment for their customers and friends and who roar with anguish when the hotels tell them they can't give them ballrooms or suites or special consideration. Now and then firms who are not even exhibiting at the Metal Show will try to steal a lot of thunder by staging outside entertainment. Oddly enough, they are the ones who yell loudest over failure to get special consideration.

Neither the hotel managements nor the Metal Show management wants to become involved in heated arguments with irate room-seekers. Everybody does his level best to take care of legitimate requests and, when you consider the demand, they do a pretty fair job of it.

In Cleveland, the Housing Committee will establish its policy and turn the task of room assignment over to the **Cleveland Convention and Trade Show Bureau,** a long-established outfit which knows where every room is in the area and what shape it's in.

A lot of folks never are satisfied to abide by the rules, so they get in touch with hotel managers and try to make special deals. Sometimes they run into the affable and willing-to-help fellows who assure them that something will be done. It almost never is—and who gets the trouble? The Show management gets told, many times per day during the week of the Show, that it has done a poor job of room assignment. Once, long ago, the Show management decided to keep out of the hotel situation entirely. It washed its hands of even being a part of the Housing Committee—which didn't function—and it was a free-for-all that turned ordinarily calm and stable men into fuming, frantic rebels who demanded that something be done about the whole mess.

Not too much can be done about it, actually. Not in the sense that everybody is going to get everything he wants. It is an almost impossible job to fit upwards of 50,000 people into a big town without disrupting a lot of things. And when there just aren't enough hotel rooms to house everybody, let alone giving rooms to individual firms, the task is one that becomes thankless as well as practically hopeless.

However, and this becomes increasingly important to those who wish to drive to Cleveland from anywhere in the nation, the Cleveland Convention and Trade Show Bureau reports that clean, comfortable and well-located motels dot the area which will be available.

Here are the steps to follow to insure getting some consideration for your hotel space requests.

Fill out and mail in promptly the hotel space forms you'll get by mail from Cleveland or from the co-sponsoring Society of which you are a member.

Ask for what you need and you'll have a better chance of getting it than if you boost your request to include customers, etc.

Use only the Official Hotel Reservation form you'll get by mail—it's the only one the Bureau will consider.

You'll have first, second and third choice of hotels, and if the Bureau is able, it will conform to your wishes. From THE METAL SHOWMAN Vol 1—No. 3.

Philadelphia Juniors Hear Talk on Photomicrography

Reported by A. Craig Hood

About 60 members attending the April meeting of the Junior Section of the Philadelphia Chapter heard a talk on "Photomicrography in the Metallurgical Laboratory", and saw a movie on the products of aluminum, entitled "Taking a Look at Tomorrow".

Don Nivling, district manager, and Bob Clapper, service engineer, Kaiser Aluminum and Chemical Sales Co., showed the film which stressed the versatility of aluminum and the number of uses it would probably be put to in the future. The film brought out the fact that the New Orleans plant of Kaiser now produces more aluminum products than the entire production of the country prior to World War II.

J. I. Wexlin, district sales manager from Bausch and Lomb Optical Co., the guest speaker, covered the photomicrography field from the earliest German microscopes to the present research metallographs with their complex sets of apochromatic lenses and sensitive focusing and light-gathering devices. He stated that optical engineering still has a long way to go in correcting a great many faults in lenses but improvements are being made constantly. The best lens available today has a numerical aperature of only 1.40, and that a magnification of 1000× this figure is the limit of resolution. Greater magnifications than about 1400× are "empty" in that no greater resolution is obtained.

Holden Co. Opens New Plant

The A. F. Holden Co. has announced the opening of a plant in Los Angeles to serve its customers in the West. The new plant will be a complete operating and manufacturing unit, and will produce 50 different salt bath compositions for any heat treating application.

Compliments

To ROBERT S. LYNCH, past chairman of the Georgia Chapter and president of the Atlantic Steel Co., on being awarded the Kiski Valley (Pennsylvania) plaque in recognition of personal accomplishments and contributions to the American steel industry.

♦ ♦ ♦

To WILLIAM J. GREDE, president, Grede Foundries, Inc., on being awarded the William H. McFadden Gold Medal of the American Foundrymen's Society, and to DANIEL E. KRAUSE, executive director, Gray Iron Research Institute, on being awarded the John H. Whiting Gold Medal of the same Society.

♦ ♦ ♦

To GEORGE J. BARKER, professor of metallurgical engineering, the University of Wisconsin, on being awarded an Honorary Life Membership in the American Foundrymen's Society.

Notre Dame Chapter Hears Merits of the Die Casting Process

Reported by R. C. Pocock

Chief Engineer, Eng. Research Lab. Bendix Products Div.

The relative merits and special application of die casting were presented at the Notre Dame Chapter by H. E. Shepard, vice-president, engineering and sales, Rupert Diecasting Co., in a talk on "Design, Development and Applications of Die Castings in Industry Today".

Mr. Shepard has been associated with the diecast business for 18 years, which means his experience goes back far enough to include some of the early pitfalls and difficulties which beset the industry in its infancy. He stressed the point that a thorough knowledge of die-casting techniques and limitations was necessary in order to get the most out of it. When used with a full understanding of its best features it is possible to turn out a product having all the necessary properties of strength and beauty at a price well below that of any other method of fabrication.

A sound movie on "Die Casting" was shown through the courtesy of the New Jersey Zinc Co., and numerous examples of die castings, which illustrated the complex cross sections obtainable by this method, were exhibited.

Mr. Shepard also stressed the point that good die castings were possible only through a very rigid control of the alloys used—lead, tin and cadmium deviations from specification being especially detrimental.

Talks on Deep Drawing Of Sheet and Strip Steel

Reported by Arnold Bowers

Minneapolis-Moline Co.

The Minnesota Chapter heard Ralph W. E. Leiter, assistant director of the main laboratory of the Budd Co., speak on "Deep Drawing and Stamping of Sheet and Strip Steel", at a recent meeting.

Mr. Leiter illustrated his talk with slides of various stampings and deep drawn parts showing many different types of defects common to the industry, and elaborated on the cause and cure of the different defects.

Steel quality is a prime concern of the stamping and deep drawing industry. Chemistry and grain size must be closely controlled to produce the low hardness and good ductility necessary for deep drawing. The desired grain size for deep drawing is 100 to 250 grains per sq. in. at a magnification of 100 X. Too coarse a grain size results in an orange peel effect at the surface, and too fine a grain size increases the hardness.

Rimmed steel for exposed parts is usually purchased with a temper pass following the anneal. Without the temper pass unsightly stretcher strains usually show up at the surface. Rimmed steel has good drawing properties and a good finish but with the temper pass it is susceptible to age hardening. The effects of aging on the return of stretcher strains can be offset by passing the material through a special roller leveler. Aluminum killed steel has very good drawing properties and is not susceptible to age hardening but does not have as good a surface as rimmed steel.

Factors, such as die design, size and shape of blank, and lubrication, also affect the success of deep drawing. Preforming the blank prior to deep drawing tends to put metal where it is needed and thus avoids too much stretch at vital spots.

Panel on Castings Vs. Forgings in Boston

The Boston Chapter Heard Harry H. Harris (Left), President, General Alloys Co., and G. W. Motherwell (Right), Vice-President in Charge of Manufacturing, Wyman-Gordon Co., Discuss "Castings Versus Forgings" During a Panel Meeting. G. G. Leitch (center) was the moderator of the panel

Reported by William F. Collins

United-Carr Fastener Co.

Over 250 members and friends of the Boston Chapter were treated to an excellent panel discussion on "Castings vs. Forgings". Harry H. Harris, president, General Alloys Co., spoke on "Castings—Their Manufacture and Application", and G. W. Motherwell, vice-president in charge of manufacturing, Worcester Division, Wyman Gordon Co., spoke on "Forgings—Their Manufacture and Application".

Mr. Motherwell stated that extrusions, forgings and castings were not cure-alls, but each in their proper place has a distinct advantage over the other. In the aircraft industry, where forgings and castings are both essential, the question arises as to which will do the best job for a given application. In the manufacture of aircraft parts, the forging manufacturers are faced with the problem of finding a light weight material which will have good tensile properties, and which will also be able to withstand great compressive pressures. Planes flying at terrific speeds could cause an increase of several hundred degrees Fahrenheit on the skin surfaces of the metal. He showed many slides illustrating the various types of forgings used in the aircraft industry.

Since 1935, the speaker stated, there has been an increase of over 350% in the demand for forgings in this country and over $500,000,000 is currently being spent for new forging presses.

Mr. Harris stated that the production of castings is the second largest in the metals industry. Cast cam shafts are being used in Ford and Chrysler automoblies quite successfully. Castings are also being considered for guided missiles, and in the high-temperature field they have many specific applications. In the past there have been objections to the use of castings because of sand impregnation or other foreign substances on the surface of the metals. The more aggresive foundries are now working on an advance casting process in which molds that will not react with molten metals are being developed, producing castings with clean surfaces and such close tolerances that in many cases machining operations will be eliminated.

Tells How to Grind Hardened Steels

L. P. Tarasov (Right), Who Spoke on the "Metallurgical Aspects of Grinding Hardened Steel" at the Lehigh Valley Chapter, Is Shown With B. F. Shepherd, Chief Metallurgist, Ingersoll-Rand Co., Technical Chairman

Reported by D. A. Lamb
Metallurgical Department
Ingersoll-Rand Co.

L. P. Tarasov of Norton Co.'s research and development department spoke on the "Metallurgical Aspects of Grinding Hardened Steel" before the Lehigh Valley Chapter. He discussed grinding in the light of present-day concepts and explained that both mechanical and chemical factors can be involved. A distinct difference exists between the ordinary machining process and that of grinding: in the former, every effort is made to minimize tool wear, whereas successful grinding is dependent upon achieving an optimum rate of controlled wheel wear.

Three separate factors contribute to wheel wear—attribution of the cutting points, which leaves them smooth and dull, grain fracture, which restores their sharpness, and bond fracture, which permits new grains to start cutting. Attritious wear is detrimental because excessive heat is generated in grinding with a dull wheel. Good grinding conditions result from a suitable balance of attritious and fracture wear, which is obtained in turn from the use of the right wheel for the particular operation and material.

Grindability of various steels can best be expressed in terms of an index which is the ratio of material removed to the rate of wheel wear under some particular set of grinding conditions. It has been established that vanadium and chromium decrease the grindability of toolsteels because they form extremely hard carbide particles that resist the grinding action of the wheel and cause it to wear rapidly. Evaluation of the grindability of some 30 brands of toolsteels has made it possible to predict the grinding response of other steels from their chemical analysis.

In connection with troubleshooting involving grinding difficulties, the following comments were offered.

Cracking of ground surfaces comprises the most serious trouble, and the causes may generally be ascertained by a logical and judicious approach to the problem. Grinding cracks are shallow and are characteristically perpendicular to the grinding direction. Their occurrence is related to the "crack sensitivity" of the particular material involved. An insensitive steel cannot be cracked regardless of how abusively it is ground, while a sensitive steel will crack when subjected to a sufficient amount of grinding heat, less heat being needed to crack the more sensitive steels.

Among the most common metallurgical factors that adversely influence sensitivity to cracking are: (1) the presence or retained austenite in highly alloyed steels, or (2) an excessively high carbon content with an attendant cementite network in carburized steels. It has been noted that a double tempering of high speed steel eliminates its tendency to crack in grinding.

Existing cracks that are not visually apparent on the "as ground" surface may be detected best by magnetic particle inspection.

A simple etching technique was described for detecting grinding burn in hardened steel when the discoloration caused by excessive grinding heat has been cleaned off, either as part of the normal grinding operation or because the operator tried to hide his defective work.

Details Advantages of Titanium—the New Metal

Reported by W. M. Hagist
University of Rhode Isand

D. W. Kaufmann, assistant sales manager of Rem-Cru Titanium, Inc., discussed "Titanium—the Metal of the Future" recently at Rhode Island.

Mr. Kaufmann reviewed the development of titanium from the time it was discovered, through laboratory stages to the first commercial material, which was produced at a cost of some $3000 per lb. During the past five years concentrated research and development programs devoted to this material have brought it to the production stage with a total sponge capacity of over 1000 tons last year and a projected 28,000 tons in the near future. During this relatively short period the price has been reduced to about $10-$20 per lb. for the most common forms.

Prices are high because of difficulties in separating titanium from its ore to produce a ductile usable material. This is caused by the metal's strong activity and affinity for practically all the other elements. However, titanium's unique combination of light weight, high strength (both at room as well as moderately elevated temperatures), and its remarkable corrosion resistance—it is completely impervious to chloride solutions such as salt water and marine atmospheres —has brought about this unusually rapid development.

Aircraft parts which take advantage of titanium's excellent strength-weight ratio were demonstrated, and indications of the possibilities of overcoming expense of replacing parts exposed to corrosive environments were noted.

Shell Molding Process Described at Toledo

Reported by R. L. Adams
Chief Metallurgist, National Supply Co.

Members of the Toledo Chapter heard Richard Herold, manager of the foundry products department of the Borden Co., give an informative talk on "Shell Molding" at a recent meeting.

Many points of interest were covered, including the application of the process to both ferrous and nonferrous metals. While the maximum size of casting at the present time is about 200 lb., Mr. Herold expressed the opinion that Yankee ingenuity would soon find ways to increase this limit. Shell cores for dies weighing nearly 1000 lb. have been satisfactorily used. While no cost figures were given, this feature is very attractive where sufficient volume is required and savings in machining are considered.

In many instances shell molding is now replacing fabrications. The fine detail and accuracy of parts produced by this method, including the minimum amount of draft required, are a few of the advantages of the shell molding process.

Lower Lakes Conference Speakers

Rochester Chapter Was Host for the Regional Spring Conference Held by the Buffalo, Northwestern Pennsylvania, Ontario, Rome, Southern Tier and Syracuse Chapters. Capacity crowds heard the 11 technical papers and visited the Bausch & Lomb Optical Co., Consolidated Machine Tool Corp., Gleason Works, and Eastman Kodak Co.'s Kodak Park plants. Above right are: W. A. McIntyre, Ontario; R. S. Guinan, Rochester vice-chairman; G. C. Monture, Mines Branch, Ottawa, speaker; and R. J. Barr, Rochester chairman. Left: J. O. Jeffrey, Cornell University; J. S. Meyer, International Business Machine Corp.; R. J. Berkol, Ontario; and R. V. Adair, Gleason Works, Rochester. Center: N. J. Finsterwalder, Rochester secretary; A.S.M. President R. L. Wilson; and R. J. Barr, Rochester chairman. (Reported by Lacy Smith, Eastman Kodak Co.)

Describes Types of Heat Treating Furnaces and Atmosphere Generators

Reported by James C. Farlow
American Cast Iron Pipe Co.

At Sustaining Members' night the Birmingham Chapter heard a program on "General Types of Heat Treating Furnaces and Atmosphere Generators", presented by Norbert K. Koebel, director of research, Lindberg Engineering Co.

Mr. Koebel gave a brief history of atmosphere controlled heat treating. The blacksmith actually was the first heat treater to practice atmosphere control. This was accomplished by placing the steel in the correct spot in his charcoal fired furnace. The next step in atmosphere control was the gas-fired furnaces where a slightly oxidizing atmosphere was controlled. This type of atmosphere gave a slight scale with no decarburization, but newer types of steels have required different types of atmosphere control.

An atmosphere free of carbon dioxide and low in water vapor is required to give the best heat treatment. The higher the carbon content of the metal, the lower the per cent of moisture that can be allowed in the atmosphere to prevent decarburization. Furnace design is important in controlling the water vapor and carbon dioxide. There must be a means provided for purging the furnace and the material entering the heating zones. This makes the size of the furnace important and for small parts the furnace openings should be small. The cost of atmosphere generators is one of the major items of controlled atmosphere heat treating; reducing loss of generated atmosphere will reduce over-all cost.

Controlled atmosphere furnaces can be bought for many special types of heat treating. They offer advantages in that finish machined pieces can be heat treated without warping, and controlled atmosphere quenching does not cause shrinkage and stresses caused by oil quenching, so gives a part with a longer life, provided the tool can be made of a steel having high hardenability.

Summer Job List Available

The American Society for Metals has ready and available a list of 2,260 job opportunities for 1953 summer employment for metallurgical and other engineering students. The list has been mailed to all engineering schools in the United States and Canada for the attention of those students who wish to continue contact with their technical studies while earning money during their vacation from the class room. Additional copies of the list may be obtained by writing to A.S.M. Headquarters, 7301 Euclid Ave., Cleveland 3, Ohio.

Explains Gas Carburizing Process

Walter H. Holcroft, Guest Speaker at the Indianapolis Chapter, Discussed "Gas Carburizing". Shown are, from left: Carl O. Sundberg, chapter chairman; Mr. Holcroft, of Holcroft and Co.; and W. Ellsworth, treasurer

Reported by J. L. Fehrenbach
Indianapolis Drop Forging Co.

Members of the Indianapolis Chapter heard a lecture on "Gas Carburizing" by Walter H. Holcroft, vice-president and technical director, Holcroft and Co., at a recent meeting.

Mr. Holcroft related the history of the modern gas carburizing process which dates back over 70 years. In a review of the various types of equipment associated with the process of gas carburizing and carbonitriding, furnaces were classified according to type (batch or continuous), and to methods of handling parts as they pass through the furnace. A series of slides of the various types of furnace were presented and advantages and disadvantages of each type were explained.

So that the group could fully appreciate the different designs of furnaces, the mechanism of carburizing was described. Since carburizing is concerned with the solid solution of carbon in austenite, the limits of carbon content of this phase depend on the temperature and the composition of the steel.

The process was discussed in terms of chemical equilibria using partial pressures of the various gases involved. It was shown that the rate of carburization is directly proportional to the square root of the time of the operation and also proportional to the temperature and concentration of the hydrocarbons. It was noted that whenever excessively high concentrations of hydrocarbons are used, trouble can be expected if the process has to be duplicated.

Shell Molding Process Topic at Eastern N. Y.

Reported by John M. Gerken
Rensselaer Polytechnic Institute

The "Shell Molding or Croning Process" was the subject of a talk at a joint meeting of the American Foundrymen's Society and the Eastern New York Chapter A.S.M. Richard Herold, manager, foundry products department of the Borden Co., and Stanley Terhune, foundry metallurgist at Watervliet Arsenal, were the guest speakers.

The shell mold process, one of the newest developments in the science of casting metals, was discovered seven years ago in Germany by Military Occupation Teams. It has since been proved to be an excellent method for the production of close tolerances and fine finish castings.

A half mold is made by pressing a heated metal pattern plate into a mixture of fine silica sand and a phenolic resin binder. The heat of the mold partially sets the binder, causing about a ¼ in. layer of the mixture to adhere to the pattern plate. The half mold is baked to fully set the plastic bond and the cured mold is then stripped from the metal pattern. Both halves of the mold may be backed up with gravel or metal shot to withstand the pressure of the molten metal. The coarse backup material, together with the thin mold walls, result in high mold permeability so that fewer vents are required than in conventional molds.

The shell mold is supplementing the casting processes by filling the gap between precision castings and conventional sand castings. It will enable foundries to reclaim some business in the field of forgings and fabricated parts.

The main advantage of the process lies in the close tolerances and smaller sections which can be obtained in castings of any castable metal. However, savings will result only when reductions in the finishing costs of each article offset the extra cost of each mold. This is generally realized when a number of finish machining operations, normally required on sand castings or forgings, can be substantially reduced.

Since the moisture content of the mold is nil, there is no damp chilling of the fluid metal. This results in a finer and smoother casting surface allowing more faithful reproduction of details.

Additional savings are obtained through a lower proportion of rejects, greater production per unit shop area, easier inspection, and a requirement of less skilled workers.

However, because of this lessened chilling effect, the shell mold acts as a better insulator than a conventional sand mold and, thus, a section of any appreciable size must be adequately fed for a good as-cast surface.

The Borden Co. became interested in the croning process as one of the first producers of the plastic bonds necessary as a binder.

Progress in Tin Plate Industry Noted by Speaker

Reported by James C. Farlow
American Cast Iron Pipe Co.

A program on "Recent Developments in the Tin Plate Industry" was presented by R. B. Meneilly, assistant to manager of tin plate sales, United States Steel Corp., at a recent meeting in Birmingham.

Mr. Meneilly pointed out that the continuous hot and cold reduction of steel to tin mill gages and widths, and the new electrolytic tinning have brought about a complete revolution in the tin plate industry. Actually, the industry has been completely rebuilt from new foundations and on new principles during the past 20 years. Many colored slides clearly demonstrated the marked contrast between the various manufacturing steps in the old and new rolling and tinning processes.

Recent quality developments were also stressed, and the advances in steelmaking, corrosion resistance, physical characteristics, gage uniformity, flatness and shearing accuracy were pointed out. These improvements have raised the over-all quality of tin mill products to levels far beyond those of only a few years ago. The amazing protection afforded steel by tin, the outstanding qualities and characteristics developed by tin and steel when combined into tin plate and the search for substitutes were discussed.

Reference was made to some of the latest developments such as continuous annealing and X-Ray gages. The newest product of the tin plate industry is known as differentially coated electrolytic plate. This product carries different tin coating weights on the two surfaces.

Production of tin mill products continues to grow. In fact, in 1951, 5,600,000 tons were produced in the United States. This amounts to 7.1% of the steel rolled in that year. The future of the tin plate industry appears bright; new plants are being built and the capacity at many present plants is being expanded.

Cohen Discusses Heat Treating Fundamentals

Reported by John L. Everhart
Materials & Methods

"The Know-Why of Heat Treatment" was discussed by Morris Cohen of Massachusetts Institute of Technology at the April meeting of the New Jersey Chapter.

Following introductory remarks on phase changes responsible for the ability of steel to harden, Prof. Cohen discussed some of the newer conceptions.

The actual temperature at which the martensitic transformation begins is determined by the carbon and alloy content of the steel, but once this temperature is reached it is impossible to suppress the transformation completely. It has been determined that martensite forms in minute platelets which propagate with a speed approaching that of sound. Recent work at Carnegie Institute of Technology indicated the time of formation of a single platelet is about 1/10 of a micro-second.

However, in many steels austenite is not completely transformed to martensite on rapid cooling. Thus, in high speed steel, about 20% of the austenite remains untransformed at room temperature. By lowering the temperature it is possible to cause this retained austenite to transform, although the longer the steel is held at room temperature the more sluggish the reaction becomes.

Tempering of steel, which takes place in four stages, was illustrated by a series of micrographs obtained with the electron-microscope. In the first stage, on heating to 300°F., epsilon carbide precipitates; in the second, as the temperature is raised, retained austenite transforms to bainite; in the third, at higher temperatures, the epsilon carbide redissolves and cementite precipitates; while, in the fourth stage (occurring only in alloy steels), the cementite redissolves and the more stable alloy carbides are formed.

The speaker illustrated with a series of property curves that, while the tensile strength and hardness generally decrease with increasing tempering temperatures, the elastic limit increases to a maximum value at temperatures of 600 to 700°F. The reason for this behavior is still under investigation. Prof. Cohen pointed out that this phenomenon could be very valuable in the application of high strength steels of the order of 250,000 to 300,000 psi. tensile strength. These steels have tendencies toward notch sensitivity when tempered at the low temperatures required to retain the high strengths. They might function in an optimum manner if tempered to obtain the highest elastic limit rather than the highest strength and hardness.

Describes Grinding Defects and How to Eliminate Them

Reported by A. E. Leach
Metallurgist, Bell Aircraft Co.

The cause of grinding defects is just as likely to be the piece being ground as the grinding technique, according to Leo P. Tarasov of the research and development department, Norton Co., who spoke before the Buffalo Chapter on "Metallurgical Defects Caused by Grinding—Their Cause and Remedy".

A common grinding defect is small surface cracks which usually open up perpendicular to the path of the grinding wheel. Since toolsteel users have adopted the practice of double tempering, they have had far less trouble with grinding cracks. Dr. Tarasov attributed this to the elimination of retained austenite in the microstructure of the tools. He has performed tests which demonstrate that retained austenite can be a very "bad actor" during grinding. Untempered martensite can be difficult to grind without cracking.

The audience was cautioned not to mistake heat treat cracks for grinding defects.

In the course of his troubleshooting for the Norton Co., Dr. Tarasov has found that machine shops frequently have trouble with carburized cases when an intergranular network of carbides is present. A better control of carburizing conditions to reduce the carbon concentration in the outermost portion of the case nearly always eliminates the trouble.

Grinding burn can also be a source of trouble, particularly for users of toolsteel. Overtempering, or softening, usually accompanies burning. Very often this goes undetected and materially shortens tool life. Sometimes burning is so severe that surface layers are requenched to untempered martensite with a zone of softened material immediately underneath. Burning is generally indicated by surface oxide and can be detected with a light etch in weak HNO_3. When a part is ground in the quenched and tempered condition, the HNO_3 etch will show untempered martensite as a white surface, overtempered martensite as black, and the unburned material will be a color intermediate between these two.

When troubleshooting grinding cracks, the first step is to determine whether grinding conditions or heat treating is responsible. This can be done in at least a preliminary way by correlating the burn pattern with the crack pattern and taking into account the severity of the burn as shown by etching.

Speakers Develop New Pressure Nitriding Process

Reported by Willard Roth
Westinghouse Electric Corp.

The Northwestern Pennsylvania Chapter heard R. L. Chenault and G. E. Mohnkern, of the Oil Well Supply Division, U. S. Steel Corp., speak on "Pressure Nitriding" recently.

Mr. Chenault opened the talk with a resume of the conventional nitriding practice in which ammonia is dissociated about 20 to 30%, then vented and wasted. He described specialized furnace equipment used for the process and its relatively high cost.

In contrast, Messrs. Chenault and Mohnkern have developed a method of nitriding in closed containers at high pressures which uses only small amounts of ammonia and can be done in any furnace suitable for the temperature range. The method depends on the fact that at high pressures, the reaction, $2NH_3 \rightleftarrows N_2 + 3H_2$, becomes reversible, so that the ammonia is practically all consumed. The nitrided case which results has virtually no white layer, and appears to be superior in depth-hardness characteristics to the conventional case.

The procedure is to place the parts to be nitrided, along with a measured amount of ammonia liquid or vapor, in a steel vessel (usually a steel tube), which is then sealed shut and placed in a furnace. Expansion of the ammonia with recommended ammonia charges raises the pressure to values ranging from 200 to 800 psi. Penetration is somewhat faster for shallow cases than in the conventional process, and is about equal for deeper cases. The rate of formation of the "superhard" portion of the case ($>$775 Vickers) appears to be considerably greater for both heavy and light cases.

Mr. Chenault reported that the process has been applied to the conventional nitriding steels and some aircraft steels, and that work is now being done on stainless steels.

Mr. Chenault pointed out that the process is economical, using only about 5% of the ammonia per sq. ft. of surface required by the conventional process to nitride to a given depth, and requires a minimum of outlay for equipment.

Aluminum Plant to Open

Late in July a completely integrated aluminum rolling and extrusion mill will be opened in Lincoln Park, Mich., by the Wisco Aluminum Corp. This plant will make Wisco the seventh company in the United States to become a prime mill producer of aluminum, and will be the first such mill to be established in the industrial northeast section of the country east of Chicago and north of the Ohio River.

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio

Stewart J. Stockett, Technical Abstracter

Assisted by Claudia Carter, Ardeth Holmes, Norma King and Members of the Translation Group

A GENERAL METALLURGICAL

118-A. Safety Practices in the Production of Ductile Iron. Robert E. Savage. *American Foundryman,* v. 23, Apr. 1953, p. 145-149.

General discussion of the hazards involved when Mg is added to iron. Safety recommendations. 13 ref. (A7, E general, Mg, CI)

119-A. Fire Protection System Guards Scrap Baler. Morton Lissner. *Iron Age,* v. 171, Apr. 16, 1953, p. 126-127.

Automatic system for protecting baler and pit, machinery space, and control room. Photographs. (A7)

120-A. Manganese From Open Hearth Slag Could Supply Half of U. S. Needs. R. C. Buehl, M. B. Royer, and J. P. Riott. *Journal of Metals,* v. 5, Apr. 1953, p. 520-521.

Process for the recovery of Mn from openhearth slag. (A8, D2, Mn)

121-A. Sweden's Iron & Steel Industry. *Metal Bulletin,* Special Swedish Iron & Steel Issue, Mar. 1953, p. 3, 5, 7-9, 11-14, 17, 19, 21-22.

Processes of production; exports and imports. Lists and describes principal steel works. (A4, Fe, ST)

122-A. Engineering for Hot Chemistry. Peter Bell. *Canadian Metals,* v. 16, Apr. 1953, p. 48, 50.

Problems involved in laboratory handling of radioactive materials. Some of the constructional and other techniques used. (A5)

123-A. Archaeology and Metallurgy. R. J. Forbes. *Edgar Allen News,* v. 32, Apr. 1953, p. 89-92.

How metallurgy contributes to understanding early cultures. Photographs. (A3)

124-A. Metal-Finishing Wastes Treatment at the Meadville, Pa., Plant of Talon, Inc. Harry W. McElhaney. *Sewage and Industrial Wastes,* v. 25, Apr. 1953, p. 475-482; disc., p. 482-483.

Program for waste disposal of cyanides, acids, chrome, cutting oils, and caustics. (A8)

125-A. Reuse Waste Pickling Liquors. Allen G. Gray. *Steel,* v. 132, Apr. 27, 1953, p. 130, 133.

Process by which waste pickle liquors are regenerated with hydrogen chloride. No undesirable by-products are left. (A8, L12)

126-A. Safety in Wire Drawing Operations. A. E. Asel. *Wire and Wire Products,* v. 28, Apr. 1953, p. 374-375, 378, 421.

Causes of more common accidents and measures taken to avoid their repetition. (A7, F28)

127-A. Capacity, Products, Future of the Canadian Steel Industry. R. D. Hindson. *Engineering Journal,* v. 36, Apr. 1953, p. 390-394.

Statistics show growth by the end of 1953 as compared to prewar. Present expansion and products which Canadian mills can supply. Tables. (A4, ST)

128-A. Safety for the Steel Men. Ken Yarber. *Industrial Photography,* v. 2, Apr. 1953, p. 10-12, 14.

Photography is used to show both the safe and unsafe way to handle any operation and illustrates what may happen when unsafe practices are used. Photographs. (A7, ST)

129-A. Co-Operative Research *Metal Industry,* v. 82, Apr. 17, 1953, p. 309-311.

Briefly describes work of the British Non-Ferrous Metals Research Association. Photographs. (A9)

130-A. A Research Engineer Looks at Metallurgy. C. G. A. Rosen. *Metal Progress,* v. 63, Apr. 1953, p. 93-96, 194, 196.

Emphasizes closer cooperation between designers and metallurgists in a conservation program. Illustrations of what has been done. Diagrams and micrographs. (A9)

131-A. Sparks From Aluminium Paint the Firedamp Ignition Hazard. C. S. W. Grice. *Product Finishing,* v. 6, Apr. 1953, p. 58-63.

Experiments showed the danger of frictional sparks produced when rusty iron or steel coated with Al paint or sprayed Al is struck by another piece of the metal. (A7, Al)

132-A. The Bright Picture of Aluminum. Charles A. Scarlott. *Westinghouse Engineer,* v. 13, May 1953, p. 92-97.

Producers, development of the industry, sources, price, applications, and future prospects. Photographs. (A4, Al)

133-A. (Book.) Engineering Manufacturing Methods. Gilbert S. Schaller. 613 pages. 1953. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $7.00.

Aspects of manufacturing such as founding, machining, welding, hot and cold forming, heat treatment, and engineering materials. Covers light metals, plastics, copper-base alloys, and iron and steel materials. (A general, Al, Mg, Cu, ST)

The coding symbols at the end of the abstracts refer to the ASM-SLA Metallurgical Literature Classification. For details write to the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

134-A. (Book.) Iron and Steel Works of the World. H. G. Cordero, editor. 651 pages. Quin. Press, Ltd., London, England. 50s net.

Review of major plants of the iron and steel industry covering 1100 works in five continents. For each, data include address of head office, directors, capital, telegraphic address, telephone number, products, and sales offices. (A4, ST)

B RAW MATERIALS AND ORE PREPARATION

81-B. Pilot Cyclone Plant Paves Way for Two Full-Scale Operations. W. R. Van Slyke and R. A. Derby. *Engineering and Mining Journal,* v. 154, Apr. 1953, p. 88-94.

Difficulties and problems of heavy-density separation of Fe ores. Photographs. (B14, Fe)

82-B. Kaiser Steel Production Record Set by Coke and Blast Furnace Practice. W. C. Rueckel. *Journal of Metals,* v. 5, Apr. 1953, p. 509-514.

Furnace design; coke and coal research; blast furnace practice; stocking and reclaiming; ore sizing; and sinter practice. Graphs and diagrams. (B general, D1, ST)

83-B. Beneficiation of East Texas Iron Ores Basis of Lone Star Steel Operations. W. R. Bond. *Journal of Metals,* v. 5, Apr. 1953, p. 515-519.

Concentration and beneficiation problems. (B14)

84-B. Kinetics of the Oxidation of Galena in Sodium Hydroxide Solutions Under Oxygen Pressure. J. E. Andersen, J. Halpern, and C. S. Samis. *Journal of Metals,* v. 5, Apr. 1953; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 197, 1953, p. 554-558.

Study made of the kinetics of the reaction in which the effect of temperature, O_2 pressure, NaOH concentration, and agitation were determined. Discusses results in terms of possible mechanisms for the reaction. Graphs. 9 ref. (B14, Pb)

85-B. Domestic Chrome and Manganese Ores Can Be Upgraded and Utilized. H. A. Doerner. *Mining Engineering,* v. 5, Apr. 1953, p. 385-386.

Present situation for obtaining ferro-alloys. (B10, Cr, Mn)

86-B. Upgrading Domestic Manganese Ores by Leaching With Caustic Soda. R. V. Lundquist. *Mining Engineering,* v. 5, Apr. 1953; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 196, 1953, p. 413-417.

Leaching Mn-bearing materials with NaOH to remove caustic-soluble SiO_2 was demonstrated as a method for upgrading Mn. Spent leach liquors are regenerated by treatment with lime to precipitate $CaSiO_3$ and to reactivate the NaOH for leaching. Tables. (B14, Mn)

87-B. Double-Bond Reactivity of Oleic Acid During Flotation. A. M. Gaudin and R. E. Cole. *Mining Engineering,* v. 5, Apr. 1953; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 196, 1953, p. 418.
Results of investigation to determine change in fatty acid molecule or ion during flotation. (B14)

88-B. Thorium and Its Sources in the Western Hemisphere. A. J. Strod. *American Ceramic Society Bulletin,* v. 32, Apr. 1953, p. 122-123.
Raw material resources of Th and technology of extraction of thoria from complex and rare earth minerals. Location and history of development of principal monazite deposits. (B10, Th)

89-B. Technology Increases Mineral Reserves. A. C. Richardson. *Battelle Technical Review,* v. 2, May 1953, p. 50-53.
How improved techniques extract minerals more efficiently and economically. (B general)

90-B. The Coke Evaluation Program in Operation. B. P. Mulcahy. *Blast Furnace and Steel Plant,* v. 41, Apr. 1953, p. 408-412.
Seven tests to measure essential properties of coke. (B18)

91-B. Coal Blending Plant at a Steel Works. *Engineer,* v. 195, Apr. 10, 1953, p. 525-526.
Blending plant designed to overcome the difficulty of maintaining a required coal specification for coke-oven feed with a number of coals of widely varying coking characteristics. Photographs. (B18)

92-B. Frothing Characteristics of Cresylic Acids in Flotation. Shiou-Chuan Sun. *Institution of Mining and Metallurgy, Bulletin,* Apr. 1953, *Transactions,* v. 62, pt. 7, 1952-1953, p. 301-320.
Study of the frothability of different grades of cresylic acid and individual constituents under various conditions. Tables and graphs. 10 ref. (B14)

93-B. Adjustable Voltage Ore Bridge Drive at Otis Works. E. C. Juhnke and Clark B. Risler. *Iron and Steel Engineer,* v. 30, Apr. 1953, p. 87-92; disc., p. 92-96.
Shows that adjustable voltage drives give smooth, rapid acceleration and excellent maneuverability to ore bridge operation. Photographs and graphs. (B general, A5, ST)

94-B. Treatment Plant Operation at Giant Yellowknife. K. C. Grogan. *Canadian Mining and Metallurgical Bulletin,* v. 46, Apr. 1953, p. 210-221.
Design, equipment, and construction of plant for the recovery of free gold. Tables and photographs. (B14, Au)

95-B. Developments in Milling Practice in Southeast Missouri. Norman A. Stockett. *Mining Congress Journal,* v. 39, Apr. 1953, p. 84-87.
Milling of Pb ores. Photographs. (B13, Pb)

96-B. (Book.) **The Physical Chemistry of Melts.** 106 pages. 1952. The Institution of Mining and Metallurgy, Salisbury House, London, E.C.2, England. 15s.
Papers given at a Symposium on the "Nature of Molten Slags and Salts", Feb. 20, 1952. Includes "The Constitution of Liquid Silicates", J. O'M. Bockris; "Some Aspects of the Constitution of Liquid Oxides", J. W. Tomlinson; "Anomalies in Surface Tension of Silicates", T. B. King; "The Correlation Between Activity and Composition in Mixtures of Fused Salts", H. Flood, T. Forland, and K. Grjotheim; "Heats of Mixing in the System Ferrous Oxide-Silica in the Liquid State", M. Rey; and "Thermodynamic Aspects of Molten Slags", F. D. Richardson. (B21, P12)

C

NONFERROUS EXTRACTION AND REFINING

67-C. Arc Furnace Developed for Casting Titanium. O. W. Simmons and Hugh R. McCurdy. *American Foundryman,* v. 23, Apr. 1953, p. 121-126.
Melting and casting process; essential features of the furnace; and use of inert atmosphere to prevent contamination. Photographs. (C21, Ti)

68-C. Extraction of Zirconium and Hafnium with Various β-Diketones. Edwin M. Larsen and Glenn Terry. *American Chemical Society, Journal,* v. 75, Apr. 5, 1953, p. 1560-1562.
Distribution coefficients were determined for the partition of Zr and Hf between perchloric acid solution and a β-diketone containing benzene phase. Tables. 12 ref. (C28, Zr, Hf)

69-C. Titanium. S. W. Rowell and E. Swainson. *Discovery,* v. 14, Apr. 1953, p. 108-112.
Processes for producing high-purity Ti in quantities and mechanical properties. Photographs. (C general, Q general, Ti)

70-C. Aluminum. Continuous Casting Gaining. R. L. Hatschek. *Iron Age,* v. 171, Apr. 23, 1953, p. 77-78.
Method paves way for small firms to integrate. Techniques improve steadily. Announces new Properzi model. (C5, Al)

71-C. On-Site Generator Plants Study Shows Aluminum Reduction at Over-All Power Cost of $168/Kw. *Light Metal Age,* v. 11, Apr. 1953, p. 16-17, 36.
Typical layout, geographical factors, and plan study. Equipment and cost of power. (C23, Al)

72-C. Metallurgical and Engineering Problems. V. Kondic. *Metal Treatment and Drog Forging,* v. 20, Apr. 1953, p. 171-173.
Reviews some metallurgical and engineering problems in continuous casting in order to understand casting processes which are established industrially. (C5, D9)

73-C. Continuous Casting of Non-Ferrous Metals. F. Crowther. *Metal Treatment and Drop Forging,* v. 20, Apr. 1953, p. 173-179; disc., p. 179.
Discusses continuous casting in terms of the "Junghans" and "Alcoa" techniques as they are used for Cu and Al-base alloys. Deals briefly with other methods and metals. (C5, Cu, Al, Mg, Zn)

74-C. Copper in Smelting-Furnace Slags. G. L. Evans. *Mining Magazine,* v. 88, Jan. 1953, p. 9-16; Feb. 1953, p. 85-93; Mar. 1953, p. 145-151; Apr. 1953, p. 206-218.
Thermodynamic considerations. Evidence of existence of particular forms of Cu in smelting furnace slags. Graphs and tables. 146 ref. (C21, Cu)

75-C. (Book.) **The Physical Chemistry of Copper Smelting.** R. W. Ruddle. 156 pages. Institution of Mining and Metallurgy, Salisbury House, London, E.C.2, England. £1.
Outline of the smelting process, constitution of matte and of Cu smelting slags, formation of magnetite, Cu losses, recovery of S from smelter gases, and elimination of impurities during copper smelting. (C21, Cu)

D

FERROUS REDUCTION AND REFINING

118-D. New Use for Tunnel Kilns. Steel Production. *Brick & Clay Record,* v. 122, Apr. 1953, p. 74-75, 83.
Shows that steel can be produced from ore without change in design or operation of a 2000 to 2200° F. operating kiln. Photographs. (D8, ST)

119-D. Automatic Control of Open-Hearth Furnaces. *Engineer,* v. 195, Mar. 27, 1953, p. 456-458.
Process for controlling maximum roof temperature and furnace pressure and for automatic reversal of the furnace by operation of a reversal switch. Photographs. (D2, S16)

120-D. Towards More Pig Iron. Cargo Fleet New No. 1 Blast Furnace. *Iron & Steel,* v. 26, Mar. 1953, p. 81-86; Apr. 1953, p. 129-133.
Plant layout and equipment for crushing, grading, sintering, coking, and smelting. Charging equipment, controls, and electrical features. Diagrams and photographs. (D1, B16, Fe)

121-D. Ironmaking. Part III. Gas-Solid Reactions. Part IV. Modifications of the Blast Furnace Process. John Taylor. *Iron & Steel,* v. 26, Apr. 1953, p. 122-127.
Reduction of Fe oxides by CO. Melting processes include electro-smelting, oxygenated blast, and low-shaft furnace using a briquetted charge. 66 ref. (D1, Fe)

122-D. Physically Hot Iron Preferred for Open Hearths. Donald M. Morrison. *Journal of Metals,* v. 5, Apr. 1953, p. 522-524.
Production of hot metal for direct use in openhearth furnaces. Presents review of published opinion on the subject. Tables. 13 ref. (D2, ST)

123-D. Arc Melting for the Foundry. New Birlec Installation at Hadfields. *Metallurgia,* v. 47, Mar. 1953, p. 126-128.
Furnace features. Photographs. (D5)

124-D. (French.) **Electric Purification of Blast-Furnace Gas.** Leclerc. *Circulaire d'Informations Techniques,* v. 10, no. 2, 1953, p. 315; disc., p. 315-317.
Brief discussion. (D1)

125-D. (French.) **Advances in the Methods of Treating High Silicon Basic Bessemer Iron With Pure Oxygen.** P. Leroy. *Revue de Métallurgie,* v. 50, Jan. 1953, p. 57-71; disc., p. 71.
Introducing O_2 below the surface while filling the ladle and blowing on the surface after filling. (D3, Fe)

126-D. The All-Basic Open Hearth Furnace in Britain. David D. Howat. *Blast Furnace and Steel Plant,* v. 41, Apr. 1953, p. 391-396.
Compares basic and silica brick and discusses furnace roof design, types of basic bricks used, defects experienced in chrome-magnesite bricks, factors in all-basic furnace

performance, fuel problems, and new developments in basic bricks. Diagrams. (D2)

127-D. Pig Iron by the Krupp-Renn Process. *British Steelmaker,* v. 19, Apr. 1953, p. 186-187.

Advantages and disadvantages of the process. (D8, CI)

128-D. Steelmaking Behind the Iron Curtain. Rumania. John Cardew. *British Steelmaker,* v. 19, Apr. 1953, p. 197-199.

With Russian aid, the Rumanian iron and steel industry is being modernized and re-equipped to produce 1,252,000 metric tons of steel annually by 1955. Some developments completed and planned. (D general, ST)

129-D. Reduction of Hanging and Slipping in Blast Furnaces by Automatic Control. Otto J. Leone. *Iron and Steel Engineer,* v. 30, Apr. 1953, p. 55-72.

Factors related to hanging, channeling, and slipping. Develops logical selection of a new control method to detect and correct furnace irregularities in accordance with the concepts outlined. Diagrams, graphs, and photographs. (D1)

130-D. Application of Automatic Combustion Controls to a New Open Hearth Shop. F. S. Swaney. *Iron and Steel Engineer,* v. 30, Apr. 1953, p. 111-117; disc., p. 117-118.

Features of the new shop. Photographs and diagrams. (D2, ST)

131-D. Iron Ore Recovered From Blast Furnace Gas. W. A. Walton. *Iron and Steel Engineer,* v. 30, Apr. 30, 1953, p. 121-122.

A blast furnace flue dust recovery plant which provides complete recovery of high iron-content dust. Photographs. (D1, A8, Fe)

132-D. Progress Report on Carbon Blast Furnaces. T. J. Wilde and V. J. Nolan. *Iron and Steel Engineer,* v. 30, Apr. 1953, p. 127-128.

Brief resume of the service record of National Carbon blast furnace linings, recent trends in use and design, and a detailed discussion of the current approach toward improved service. (D1)

133-D. Bethlehem's Johnstown Plant. A Century of Pioneering. T. J. Ess. *Iron and Steel Engineer,* v. 30, Apr. 1953, p. J1-J20.

Development of the plant; its source of raw materials; coke plants; blast furnaces; openhearth; blooming and billet mills; plate mills; merchant mills; rod and wire mill; and miscellaneous manufacturing departments. Tables, photographs, and diagrams. (D general, F general, ST)

134-D. American Iron and Steelmaking Practices Compared With British. *Metal Progress,* v. 63, Mar. 1953, p. 170, 172, 174, 176, 178, 180; Apr. 1953, p. 138, 140, 142, 144, 162, 164.

Condensed by E. C. Wright from the Productivity Report, "Iron and Steel", June 1952, 147 pages, published by Anglo-American Council on Productivity. Presents a chapter-by-chapter review comparing U. S. and British steelmaking practices. (D general, ST)

135-D. (French.) Disintegration of Ores. J. Bebatty. *Circulaire d'Informations Techniques,* v. 10, no. 2, 1953, p. 291-302.

A review of experimental work on the investigation of breaking up of ore particles in the blast furnace. (D1)

136-D. Firebricks in the Iron and Steel Industry. G. Reginald Bashforth. *Claycraft,* v. 26, Apr. 1953, p. 302-305.

Use of bricks in blast furnace linings, blast stoves, cupola linings, openhearth furnace doors, and casting pit refractories. (D1, D2)

137-D. Induction Stirrer Improves Quality of Steel. Eric G. Malmlow and Quentin Graham. *Steel,* v. 132, May 4, 1953, p. 104, 107, 110.

Use of low-frequency power results in suitable speed of magnetic field over surface of bath and its deep penetration into molten metal in electric furnace. (D5, ST)

E

FOUNDRY

204-E. Mechanics of Foundry Mechanization and Improved Methods. R. J. Anderson. *American Foundryman,* v. 23, Apr. 1953, p. 114-120.

How reduced costs and improved quality can be obtained through mechanization and better work methods. Photographs. (E general, A5)

205-E. Effect of Sand Flowability on Casting Surface Finish. H. H. Fairfield and James McConachie. *American Foundryman,* v. 23, Apr. 1953, p. 127-132.

Results of experiments made to measure flowability of molding and core sands and to relate flowability test values to surface finish. Photographs and tables. (E18)

206-E. Mystery of Shell Molding Patterns Explained. Ray Olson. *American Foundryman,* v. 23, Apr. 1953, p. 135-139.

Use of Al patterns, treatment for cast iron, pattern damage, ejector pin design, and method of vertical pouring. Photographs. (E16, Al, CI)

207-E. Segregation Study in Bronze Using a Radioactive Technique. W. C. Winegard. *American Foundryman,* v. 23, Apr. 1953, p. 140-141.

Results for various cooling conditions in the segregation of tin in small castings of 10% bronze. (E25, Sn, Cu)

208-E. How Gas Equipment Assures Exact Temperature for Investment Casting by Lost Wax. Arthur Q. Smith. *Industrial Gas,* v. 31, Apr. 1953, p. 3-5.

Casting pure Cu by the lost wax process. Photographs. (E15, Cu)

209-E. (German.) Recent Cupola Furnace Construction, Especially the Hot Air Type. Fritz Schulte. *Giesserei,* v. 40, Jan. 22, 1953, p. 45-52.

Significance of maintaining constant specific air feed, which is possible only if the cross section of the furnace remains constant. Graphs and diagrams. (E10)

210-E. (German.) Nodular Cast-Iron Practice. H. Gries. *Giesserei,* v. 40, Feb. 19, 1953, p. 93-103.

Reviews industrial experiences. Photographs and graphs. 17 ref. (E25, CI)

211-E. Foundry Characteristics of Aluminum and Magnesium. M. W. Martinson. *Canadian Metals,* v. 16, Apr. 1953, p. 28, 30, 32.

Preparation of molds and pouring practice. Tables. (E11, Al, Mg)

212-E. Deoxidation of Nickel and Copper Alloys. *Canadian Metals,* v. 16, Apr. 1953, p. 38.

Some of the factors involved in deoxidation. (E25, Ni, Cu)

213-E. High-Speed Counting of Steel Foundry Dust Particles. G. M. Michie. *Engineer,* v. 195, Apr. 3, 1953, p. 485-487.

Use of the "Flying-Spot" microscopic technique. (E general, A8)

214-E. Shaking Out, Cleaning, and Welding Steel Castings. John Howe Hall. *Foundry,* v. 81, Feb. 1953, p. 92-96, 251-255; Mar. 1953, p. 194-195, 284-285, 288-290; Apr. 1953, p. 96-97, 250-252, 254-256; May 1953, p. 218-220, 222, 226, 229, 232, 235.

Advantages and disadvantages of wet blasting, use of metallic shot or grit, removal of gates and risers with gas torches, removal of grinder dust, and blasting melted metal. Repair welding practice and various cleaning and finishing operations in the steel foundry. Recommendations for types of electrodes suitable for welding steel castngs and procedure to be followed in welding. Stress-relief of welded castings, effect of H_2 on welds, and a discussion of mechanical properties of welds. Photographs, diagrams, and micrographs. (E24, L10, K1, J1, CI)

215-E. Gray Iron Castings. Charles O. Burgess. *Foundry,* v. 81, May 1953, p. 118-123.

Advances including improved sand and metal technology, better cupola control, and plant modernization. Developments which seem likely to influence future. Photographs. (E11, CI)

216-E. Aluminum Castings. Floyd A. Lewis. *Foundry,* v. 81, May 1953, p. 124-129.

Development of new alloys, increased plant mechanization, and emphasis on quality control have increased use of Al castings. Photographs. (E general, Al)

217-E. Steel Castings. Charles W. Briggs. *Foundry,* v. 81, May 1953, p. 130-135.

Briefly reviews developments which have created considerable interest among steel foundrymen during the last seven years, and points out what the future may have in store. Photographs. (E11, CI)

218-E. Brass and Bronze Castings. Vaughan C. Reid and Paul G. Maganus. *Foundry,* v. 81, May 1953, p. 136-139.

Improvements in alloys and molding materials, foundry equipment, melting and molding methods have contributed to more efficient production of higher quality castings in Cu-base alloys. Photographs. (E11, Cu)

219-E. Malleable Iron Castings. James H. Lansing. *Foundry,* v. 81, May 1953, p. 140-145.

Research activities in ways to improve and standardize malleable foundry operations include work on core practices; gating and feeding methods; and study of the effect of various atmospheres on melting and annealing. Photographs. (E11, CI)

220-E. Magnesium Castings. T. E. Leontis and H. E. Elliott. *Foundry,* v. 81, May 1953, p. 146-149.

Availability of new alloys, adoption of new core binders, perfection of gating techniques, and improvements in grain refinement have helped apply Mg castings to aircraft needs. (E11, Mg)

221-E. A Modern Stove Foundry. A. R. Parkes. *Foundry Trade Journal,* v. 94, Apr. 2, 1953, p. 377-383.

Layout and working methods of foundry equipped specifically for the production of stove-grate castings. Photographs. (E11)

222-E. Production of Sound Castings by Controlled Rate of Heat Transfer. C. A. Parlanti. *Institution of Engineers & Shipbuilders in Scotland, Transactions,* v. 96, Part 5, 1952-53, p. 246-259; disc., p. 259-260.

Metal cast in a chilled mold has better physical properties than that in an ordinary mold. Use of Al molds to control rate of heat transfer throughout the casting. Photographs. (E25, Al)

223-E. Thor Resins for the Production of Shell Moulds and Cores. *Machinery* (London), v. 82, Apr. 10, 1953, p. 687-689.

Mold assembly; runner and gating arrangements; precautions; and advantages of the process. (E16)

224-E. Founding High-Tensile Brasses and Bronzes. Part I. Introduction. Part II. Running Technique. Part III. Liquid Shrinkage. Part IV. Feeding. Part V. Patterns and Moulding. Part VI. Furnaces. Part VII. Melting. Part VIII. Moulding Technique. G. W. Reid. *Metal Industry,* v. 82, Feb. 13, 1953, p. 121-123; Feb. 20, 1953, p. 145-147, 151; Feb. 27, 1953, p. 161-163, 170; Mar. 6, 1953, p. 185-187; Mar. 13, 1953, p. 209-211; Mar. 20, 1953, p. 229-231; Mar. 27, 1953, p. 249-251; Apr. 10, 1953, p. 281-284.

Problems associated with founding of Mn and Al bronzes. Written for those with little or no experience who may be required to make castings. Tables and diagrams. (E11, Cu)

225-E. (German.) **Further Examples for Forming Blowholes.** F. Roll. *Giesserei,* v. 40, Jan. 22, 1953, p. 53-54.

Examples of blowholes in various cast irons. Economic means of elimination. (E25, CI)

226-E. Investment Castings. *Electrical Manufacturing,* v. 51, May 1953, p. 93, 96-97.

Fundamental design rules. Typical applications of the process. (E15)

227-E. Better Parts Flow Trims Foundry Costs. Herbert Chase. *Iron Age,* v. 171, Apr. 30, 1953, p. 97-101.

Continuous parts flow and improved layout of machinery in casting cleaning plant which increased cleaning efficiency and reduced cleaning costs. Photographs. (E general, L10, L12, CI)

228-E. Press Dies Cast From Plaster Forms. Howard Cope and Harvey Landis. *Machinery* (American), v. 59, Apr. 1953, p. 190-191.

Formation of the dies. Photographs. (E16, SG-j)

229-E. Considerations for Successful Use of Investment-Cast Type 410. Davidlee Von Ludwig. *Metal Progress,* v. 63, Apr. 1953, p. 84-87.

Surface pitting which often occurs when Types 410 and 416 stainless steels are cast. Mechanical tests and metallographic studies using Types 410, 420, 440, 302, 303, and 394. Suggests need for future study. (E15, Q general, M27, SS)

230-E. Correct Impregnation of Castings Prevents Leakage, Internal Corrosion, and Spotted or Blistered Finishes. Wilson N. Pratt. *Metal Progress,* v. 63, Apr. 1953, p. 88-92.

Impregnation of castings by internal, external, and batch-type vacuum pressures. Compares impregnating materials and their properties. Benefits of proper impregnation. Photographs. (E25)

231-E. Sonnets for the Metallurgist. R. P. Lister. *Metal Progress,* v. 63, Apr. 1953, p. 110-112.

Trials and tribulations which Benvenuto Cellini encountered when casting his "Perseus". (E15, Cu)

232-E. Graphite Molds Turn Out Steel Wheels of Uniform Structure. *Railway Locomotives and Cars,* v. 127, May 1953, p. 61-65.

Advantages and design of the wheel. The graphite mold, pouring, and tests. Photographs. (E11, CI)

F

PRIMARY MECHANICAL WORKING

116-F. Restored Slabbing Mill Attains High Output. Scott Elliott. *Iron Age,* v. 171, Apr. 16, 1953, p. 118-120.

Rehabilitation of soaking pits, scale removal units, and manipulating equipment. Photographs. (F23)

117-F. Effect of Various Elements on Hot-Working Characteristics and Physical Properties of Fe-C Alloys. C. Travis Anderson, Robert W. Kimball, and Francis R. Cattoir. *Journal of Metals,* v. 5, Apr. 1953; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 197, 1953, p. 525-529.

Results obtained by the addition of varying amounts of S to Fe-C alloys. Tables and photographs. (F general, Q general, CN)

118-F. Modern Electrical Controls in a Continuous Aluminium Strip Mill. P. E. Peck. *Metallurgia,* v. 47, Mar. 1953, p. 119-126.

Problems involved in controlling drives for mills and auxiliary lines. Photographs and diagrams. (F23, Al)

119-F. Stresses, Construction, Manufacture and Life of Cold-Flow Extrusion of Steel. Karl Sieber. *Draht* (English Ed.), Mar. 1953, p. 32-37.

Stresses in simple dies, reinforcing highly stressed extrusion dies, finishing working surfaces, life of reinforced flow press dies, and short-term life tests. Photographs, graphs, and diagrams. (F24, ST)

120-F. Forming Aluminum Sheet and Plate. E. V. Sharpnack, Jr. *American Machinist,* v. 97, Apr. 27, 1953, p. 165, 167.

Data sheet considering shearing, slitting, blanking, piercing, and necking. (F29, G2, Al)

121-F. Rolls and Rolling. Part XXXIV. Rails. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 41, Apr. 1953, p. 399-407.

Diagonal pass rolling. Diagrams. (F23, CN)

122-F. Stainless Steel Tubes Extruded at U. S. Steel's Gary Plant. *Industrial Heating,* v. 20, Apr. 1953, p. 695-696, 698, 700.

Equipment and process. Photographs. (F26, SS)

123-F. How to Fabricate 430 Stainless. L. F. Spencer. *Iron Age,* v. 171, Apr. 23, 1953, p. 139-143.

How existing techniques and equipment should be altered. Photographs and diagrams. (F general, G general, SS)

124-F. Cold Extrusion Ready to Invade Metalworking Markets. D. I. Brown. *Iron Age,* v. 171, Apr. 23, 1953, p. 152-155.

Advantages of the process. Photographs and diagrams. (F24)

125-F. Baldwin Builds Large Split Die Forging Press. *Iron and Steel Engineer,* v. 30, Apr. 1953, p. 134.

Briefly describes and illustrates the new press. (F22)

126-F. Magnesium. Direct Extrusion of Alloys. John Alico. *Light Metal Age,* v. 11, Apr. 1953, p. 10-11, 22-23, 26.

Extrusion process for forming tubing and hollow shapes, extrusion ratio, butt discard, quenching, relation of speed and temperature, and application of products. 8 ref. (F24, J26, Mg)

127-F. Hot Extrusion of Metal at National Tube Division of U. S. Steel Corp. *Modern Industrial Press,* v. 15, Apr. 1953, p. 6, 8.

Equipment and procedure for extruding stainless steel. Photographs. (F24, SS)

128-F. A Dramatic Continuous Press Forging Process. J. D. M. White. *Modern Industrial Press,* v. 15, Apr. 1953, p. 36, 40, 42, 44, 46.

Describes and illustrates process. (F22)

129-F. (Russian.) **Modeling of Hot and High-Speed Processes of Metal Working.** A. A. Il'iushin. *Prikladnaia Matematika i Mekhanika,* v. 16, June-Aug. 1952, p. 385-398.

Laws of similarity. Concludes that ratio of characteristic time to the square of linear dimension must be the same in the model as in actual production. 2 ref. (F general)

130-F. An Examination of Modern Theories of Rolling in the Light of Rolling Mill Practice. N. H. Polakowski. *Sheet Metal Industries,* v. 30, Mar. 1953, p. 237-243.

Speed correspondence between stands of tandem mills, loss of synchronism between stand motors at reduced speed, and methods of automatically maintaining constant speed ratio between tandem mill stands by means of IR-drop compensation. Diagrams and tables. 8 ref. (F23, S18)

G

SECONDARY MECHANICAL WORKING

145-G. How to Machine the Rarer Metals. *American Machinist,* v. 97, Apr. 13, 1953, p. 183, 185.

Tooling recommendations for W, Mo, Ta, Ti, and Zr. (G17, W, Mo, Ta, Ti, Zr)

146-G. How to Solve Fabricating Problems of High-Temperature Alloys. Hiram Brown. *Iron Age,* v. 171, Apr. 16, 1953, p. 121-125.

Correlation of laboratory tests and production results. Shows that proper mill processing and heat treatment can prevent forming trouble. Micrographs. (G general, SG-h)

147-G. Hydraulic Lathe Cuts Roll-Machining Time. B. A. Wilson. *Iron Age,* v. 171, Apr. 16, 1953, p. 128-129.

Shows that hydraulic pressure keeps cutting tool at constant pressure against the roll. Lateral movement of the tool permits one continuous spiral cut along an even-faced roll. (G17)

148-G. Large Spun Metal Shapes. W. A. Wenman. *Materials & Methods,* v. 37, Apr. 1953, p. 93-95.

Techniques, advantages, applications, and use of hot spinning. Photographs. (G13)

149-G. Machinability of Metal Powder Parts. John L. Everhart. *Materials & Methods,* v. 37, Apr. 1953, p. 98-100.

Applications where at least some machining is required to reach the final shape. Photographs. (G17, H general)

150-G. Thread and Form Rolling. Part II. Machine Type Selection, Material Characteristics. C. T. Appleton. *Screw Machine Engineering,* v. 14, Apr. 1953, p. 60-66.

Reciprocating thread rolling machines; thread roll and die selection; die face width; single and multiple settings; and rollability. Tables and diagrams. (G12)

151-G. On How to Select the Best Lubricant or Coolant for Machining Stainless Steels. *Screw Machine Engineering,* v. 14, Apr. 1953, p. 73-74.
Data sheet on how to determine the best mixture and why cutting oils should be kept cool. (G21, SS)

152-G. Speeds & Feeds for Box Milling Steel. *Screw Machine Engineering,* v. 14, Apr. 1953, p. 75-76.
Data sheet. (G17, ST)

153-G. (German.) **Some Remarks on the Evaluation of Machinability Tests.** Wilhelm Spath. *Metalloberfläche,* v. 6, Dec. 1952, p. A186-A189.
Experimental data. Graphs. (G17)

154-G. Integrally - Stiffened Skin Milling. J. Daugherty and J. M. Delfs. *Aero Digest,* v. 66, Apr. 1953, p. 90-102, 104, 106, 108.
Machine developed specifically for milling self-reinforced aircraft skins from sheets of solid or rough-forged Al alloy. Photographs. (G17, Al)

155-G. Zone-Heated Dies Deep-Draw Thin Magnesium. *American Machinist,* v. 97, Apr. 27, 1953, p. 129-131.
Shows that sheets 0.040 to 0.064 in. thick can be drawn in depths to 30 in. in zone-heated dies in a 600-ton hydraulic press. Stock is spray lubricated and generally preheated. Photographs. (G4, Mg)

156-G. Silicon-Carbide Wheels for Carbide Grinding. Anderson Ashburn. *American Machinist,* v. 97, Apr. 27, 1953, p. 142-144.
Use of SiC as a replacement for diamond wheels. Photographs. (G18, C-n)

157-G. Even a Key Can Cut Through the "Unmachinable" With New Ultrasonic Tool. *Inco Magazine,* v. 26, no. 1, 1953, p. 12-14.
Electronic device which vibrates at 1,620,000 times a minutes and can drive through glass, metals, and other materials of diamond-like hardness. Photographs. (G17)

158-G. Machining Practices Affect Mechanical Properties of Aluminum. *Iron Age,* v. 171, Apr. 23, 1953, p. 151.
Tests using 24S-T4 alloy. Tabulated results. (G17, Q general, Al)

159-G. Arc-Cutting Process for Aluminium Alloys. *Light Metals,* v. 16, Apr. 1953, p. 114-115.
Cutting process using an electric arc and consumable steel electrode. (G22, Al)

160-G. The Impact Extrusion of Aluminium. K. A. Galloway. *Light Metals,* v. 16, Apr. 1953, p. 125-128.
Technique, plant, tools, tool design, and accessory factors needed for production of successful impact extrusion. Diagrams. (G5, Al)

161-G. Tools for Machining Aluminum. *Metal-Working,* v. 9, May 1953, p. 18-20.
Tool shapes, materials, and finishes. General machining practices for Al alloys. Tables. (G17, Al, TS)

162-G. Republic Steel Corporation Turns to Production of Steel Kitchen Units. Walter Rudolph. *Modern Industrial Press,* v. 15, Apr. 1953, p. 13, 16, 18, 20.
Pictorial presentation. (G general, T10, ST)

163-G. Lithium-Based Multi-Purpose Grease for Use in Stamping Plants. *Modern Industrial Press,* v. 15, Apr. 1953, p. 22, 24, 46.
Properties and advantages of the grease. (G3)

164-G. Fundamental Factors in Grinding Titanium. Gordon T. Rideout. *Modern Metals,* v. 9, Apr. 1953, p. 42, 44.
Influence of speed, grinding fluids, rust inhibitors, fire hazard with oil, grit size, and how to finish grind. (G18, Ti)

165-G. Fundamental Factors in Machining Titanium. M. E. Merchant. *Modern Metals,* v. 9, Apr. 1953, p. 60, 62.
Reasons why Ti is difficult to machine. Photographs. (G17, Ti)

166-G. Tin-Box Making. G. Taylor. *Sheet Metal Industries,* v. 30, Apr. 1953, p. 277-280.
Details of some special tools for increased production. (G3, CN, Sn)

167-G. The Continuous Sheathing of Electric Cables With Aluminium. Details of New Process Developed by the General Electric Co. Ltd. and Pirelli-General Cable Works Ltd. *Sheet Metal Industries,* v. 30, Apr. 1953, p. 291-295.
Manufacture, mechanical performance of welded sheath, weld strength and soundness, and field installations. Photographs. (G general, K general, T1, Al)

168-G. New Wrinkle in Stretch Wrap Forming. M. J. Connington and W. F. Thurber. *Steel,* v. 132, Apr. 27, 1953, p. 102-103.
Development of curved jaws for gripping metal sheet. Photographs. (G9)

169-G. Extrusion Goes Commercial. *Steel,* v. 132, Apr. 27, 1953, p. 106, 108.
Production of a variety of commercial shapes. Photographs. (G5, CN)

170-G. New Ideas Yield Dividends. Thomas A. Dickinson. *Steel Processing,* v. 39, Apr. 1953, p. 163-165, 191.
Methods for producing sheet metal parts and assemblies. Photographs. (G general)

171-G. Tool Materials for Punches and Dies. Lester F. Spencer. *Tool Engineer,* v. 30, May 1953, p. 35-40.
Factors to be considered when selecting steels for tools. (G2, TS)

172-G. Copper-Nickel-Tin Coining and Stamping Alloys. J. W. Cuthbertson. *Metal Industry,* v. 82, Apr. 17, 1953, p. 301-303.
Investigation to use Sn as a partial substitute for Ni. Tables and diagrams. (G3, Cu, Ni, Sn)

173-G. Carbon Dioxide Permits Improved Machining Time. E. W. Bartle. *Machinery* (American), v. 59, Apr. 1953, p. 157-158.
Cutting speeds and feeds employed in contour-machining heat resisting steel parts for aircraft jet engines were increased by using liquid CO_2 to absorb heat generated in such operations. Photographs. (G21, SG-h)

174-G. 52 Inches of Steel. Cutting Time: 35 Minutes. *Welding Engineer,* v. 38, May 1953, p. 56-57.
Technique which makes flame cutting economical. Apparatus, setup, and operating expenses. Photographs. (G22, ST)

H POWDER METALLURGY

35-H. How to Make Carbide Cold-Heading Dies. A. Earle Glen. *American Machinist,* v. 97, Apr. 27, 1953, p. 138-140.
Shows that fewer machine stops for die changes, lower die cost per piece, and maintenance of closer dimensional tolerances generally result when cemented-carbide nibs and hammers replace steel die parts in upsetters. Diagrams. (H general, G10, W, TS)

36-H. Tungsten-Carbide Shell Cores. Edgar Altholz. *Machinery* (American), v. 59, Apr. 1953, p. 159-164.
Development and production of WC shell cores which penetrate heavy armor tanks. Photographs. (H general, T2, W, C-n)

37-H. (German.) **Preparation of Pulverized Ag-Hg Alloys at Room Temperature.** F. Hund and J. Müller. *Zeitschrift für Elektrochemie; Berichte der Bunsengesellschaft für Physikalische Chemie,* v. 27, no. 2, p. 131-138.
Preparation of the alloys. Lattice constants, densities, lattice disturbances, and primary particle sizes were determined. Tables and graphs. 15 ref. (H16, M26, Ag, Hg)

J HEAT TREATMENT

93-J. Hardening Gray Cast Iron With Minimum Distortion. A. A. Armstrong. *American Foundryman,* v. 23, Apr. 1953, p. 142-144.
Methods of hardening cast iron. Some advantages and limitations of oil quenching and tempering; martempering; and austempering. Control of warpage in hardened cylinder liners is discussed with reference to the TTT-curve. (J26, CI)

94-J. Syracuse Heat Treating Corp. Boasts Eight Factors for Success. Ralph L. Manier. *Industrial Gas,* v. 31, Apr. 1953, p. 6-7, 26-27.
Describes furnace equipment. Photographs. (J general)

95-J. Dual - Frequency Induction Heating Lowers Process Costs. R. S. Segsworth. *Iron Age,* v. 171, Apr. 16, 1953, p. 113-116.
Methods and equipment for forging, heat treating, and melting. Diagrams and photographs. (J2, F21, E10)

96-J. Flame-Hardened Engine Parts for High Production. Herbert Chase. *Materials & Methods,* v. 37, Apr. 1953, p. 90-92.
Process of selective surface hardening used on steel and malleable iron parts. Photographs. (J2, CN, CI)

97-J. Modern Bell-Type, Bright-Annealing Furnace With Heat Recuperation. Johann Arens. *Draht* (English Ed.), Mar. 1953, p. 40-42.
Furnace and method of operation. Diagrams. (J23)

98-J. (German.) **Application of Isothermal Heat Treatment to Mn-Si Spring Steel.** P. G. Boting. *Metalen,* v. 8, Jan. 31, 1953, p. 21-25.
Quench-hardening and bend tests which illustrate increase in ductility of isothermally hardened material. Graphs, tables, and micrographs. (J26, Q23, AY)

99-J. Gas Carburizing. Methods Employed by the Rover Co. Ltd. for Crown Wheels and Pinions. *Automobile Engineer,* v. 43, Apr. 1953, p. 149-151.
Equipment used. Photographs. (J28, CN)

100-J. Uniform Annealed Grain Size Obtained With Radiant-Roof Furnace. C. R. MacWhirter. *Iron Age,* v. 171, Apr. 23, 1953, p. 144-146.
Pan-type annealing furnace which keeps work temperatures uniform across the hearth. Brass was used to illustrate grain growth. Photographs and micrographs. (J23, N3, Cu)

101-J. Automatic Plant Arranged for Flowline Treatment of Precision Chain Components. P. Chant and H. J. Tucker. *Machinery* (London), v. 82, Apr. 10, 1953, p. 663-669.
Variety of components produced, precision of processes, uniformity of heat treatment, and handling methods. Photographs and diagrams. (J general, A5)

102-J. Some Recent Alloy Steels and Their Heat Treatment. William C. Mearns. *Metal Treating,* v. 4, Mar.-Apr. 1953, p. 2-4, 10.
Composition, properties, and heat treatment of age hardening and extra high strength steels
(J general, Q general, AY)

103-J. Distortion Control and Hot Oil Quenching. F. E. Harris. *Metal Treating,* v. 4, Mar.-Apr. 1953, p. 5, 10.
Factors causing distortion in steel parts and procedures for quenching. (J26, ST)

104-J. Roller Hearth Furnaces Toughen Tank Feet. H. M. Webber. *Steel,* v. 132, Apr. 27, 1953, p. 100-101.
Furnace installations involving copper brazing, partial cooling, reheating, and oil quenching of tank track bodies and shoes. Photographs. (J26, K8, ST)

105-J. Pressure Nitriding for Hardening Internal or External Surfaces. R. L. Chenault and G. E. Mohnkern. *Metal Progress,* v. 63, Apr. 1953, p. 97-105.
Process which is applicable to many steel parts requiring high surface hardness, wear resistance, and accuracy of dimension. Graphs, diagrams, and photographs. (J28, ST)

106-J. Why Two "Specs" Covering Aluminum Heat Treatment. James McElgin. *Western Machinery and Steel World,* v. 44, Apr. 1953, p. 94-95.
Discusses specification MIL-S-10699 which is considered to be more accurate than MIL-H-6088.
(J general, Al)

K

JOINING

251-K. (French and German.) **Problems in Welding Research.** Carl G. Keel. *Zeitschrift für Schweisstechnik; Journal de la Soudure,* v. 43, Mar. 1953, p. 47-51.
Discusses crack sensitivity and cold brittleness of structural steels. Diagrams. (K general, Q23, ST)

252-K. (German.) **Cold-Press Welding as a Modern Form of Joining.** W. Hofmann and J. Ruge. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 95, Mar. 11, 1953, p. 233-237.
Various aspects of cold-press welding. Diagrams and graphs. 9 ref. (K5)

253-K. (Swedish.) **Base Metal Welding With Austenitic Manganese Steel Electrodes.**, Stig-Erik Erikson. *Svetsaren,* v. 17, no. 2, 1952, p. 15-20.
Use of high Mn electrodes for welding carbon steels. Micrographs. (K1, CN)

254-K. Temperature for Shrink Fits. Tyler Hicks. *American Machinist,* v. 97, Apr. 27, 1953, p. 163.
Chart which permits fast estimation of temperature needed to expand a metal ring a given amount before making shrink fits. (K13)

255-K. Welding Stainless Steels. W. M. Halliday. *Canadian Metals,* v. 16, Apr. 1953, p. 52, 54.
Details of a welding flux that has proved satisfactory. (K1, SS)

256-K. Welding Tool Steels. B. H. Chambers. *Edgar Allen News,* v. 32, Apr. 1953, p. 73-76.
Reviews 25 years of progress and research in the production of welded tools. Brazing is not included. (K general, TS)

257-K. Spot Welds in Unalloyed Titanium. *Light Metals,* v. 16, Apr. 1953, p. 120-121.
Tests and results. Micrographs. (K3, Ti)

258-K. Developments in the Metal Arc Welding of Aluminium and Its Alloys. W. I. Pumphrey, E. Van Someren, and M. R. Kilgour. *Light Metals,* v. 16, Apr. 1953, p. 132-135.
Defects of metal-arc welds, choice of electrodes, welding procedure, and preheating. Tables. (K1, Al)

259-K. Welding Rod. How to Choose It. *Linde Tips and Oxy-Acetylene Tips,* v. 32, Apr. 1953, p. 38-39.
Tabulated information covers Oxweld welding rod, purpose, qualities, flame, and Oxweld flux. (K2)

260-K. Dip Brazing Cuts Costs in Making Aluminum Heat Exchangers. *Modern Metals,* v. 9, Apr. 1953, p. 40-41.
Process which employs a bath of molten brazing flux into which a properly jigged assembly of Al parts is dipped for a predetermined period. A filler material fuses with the parent material and provides a strong pressure-tight bond. Photographs. (K8, Al)

261-K. High - Speed Photographic Techniques for the Study of the Welding Arc. I. L. Stern and John H. Foster. *Society of Motion Picture and Television Engineers, Journal,* v. 60, Apr. 1953, Part I, p. 400-404.
Detailed specifications for use of high-speed photography at rates of 3000 to 4000 frames per sec. Photographs. (K9)

262-K. Bonding Rubber to Metal—Design and Production Problems. J. H. Gerstenmaier. *Tool Engineer,* v. 30, May 1953, p. 59-62.
Abstracted from paper 21T13, "Bonding Methods for Adhering Rubber to Metal", American Society of Tool Engineers. Describes basic mechanical adhesives, types of rubbers, and application methods. Diagrams and photographs. (K11)

263-K. Welded Portal Frame Retort House. *Welding and Metal Fabrication,* v. 21, Apr. 1953, p. 116-123.
Design, construction, and welding details of a portal-frame retort house. Photographs and diagrams. (K general, T26)

264-K. Electrodes for Welding 18% Cr-8% Ni Steels. H. F. Tremlett. *Welding and Metal Fabrication,* v. 21, Apr. 1953, p. 136-144.
Weld decay, probable cause, prevention, and standard tests for assessing the weld decay resistance of steels and weld metals. Tables and micrographs. (K1, SS)

265-K. X-Ray Welds for Aluminum Tanks. Jerome Hertel. *Welding Engineer,* v. 38, Apr. 1953, p. 64, 69.
Briefly describes the inert-gas, tungsten-arc welding process. Photographs. (K1, Al)

266-K. Advanced Information for the Brazing Operator. E. F. Davis. *Welding Journal,* v. 32, Apr. 1953, p. 293-298.
The brazing of different materials; fluxes and their limitations; and design of joints and brazing alloys. (K8)

267-K. Anderson Ranch Dam Penstock Test Fracture Repaired by Welding. P. J. Bier. *Welding Journal,* v. 32, Apr. 1953, p. 313-319.
Design of penstock and outlet pipe systems; welding techniques; and successful repair of a fracture in the pipe shell. Diagrams and photographs. (K1, T4, CN)

268-K. Manual Hidden Arc Welders Halve Time on Earth Mover Components. William T. Potter. *Welding Journal,* v. 32, Apr. 1953, p. 324-328.
Application of automatic and semi-automatic submerged-arc welding in the fabrication of heavy earth-moving equipment. Photographs. (K1, CN)

269-K. The Welding of Thick Plates of High-Strength Aluminum Alloys. D. C. Martin, M. I. Jacobson, and C. B. Voldrich. *Welding Journal,* v. 32, Apr. 1953, p. 161S-171S.
Investigation to determine by what means high-strength welded joints could be produced in thick plates of strong Al alloys. Development of improved filler-metal alloys. Graphs and tables. 10 ref. (K1, Al)

270-K. Control of Penetration and Melting Ratio With Welding Technique. Clarence E. Jackson and Arthur E. Shrubsall. *Welding Journal,* v. 32, Apr. 1953, p. 172S-178S.
Penetration and melting ratio were measured for a large number of submerged-arc and coated-electrode welds in commercial quality steel using various joint designs. Useful formulas were developed for estimating penetration characteristics of a weld given the machine settings. Graphs and diagrams. 10 ref. (K1, CN)

271-K. The Semiautomatic Inert-Gas Metal-Arc Welding of Aluminum Alloys. Charles T. Gayley, Joseph R. Girini, and Walter H. Wooding. *Welding Journal,* v. 32, Apr. 1953, p. 179S-190S.
Shows that tensile properties of welded joints are affected more seriously in the precipitation-hardened Al alloys than in the cold worked and stabilized alloys. Graphs, diagrams, and tables. (K1, Q27, Al)

272-K. Gas Flow Requirements for Inert-Gas-Shielded Arc Welding. Glenn J. Gibson. *Welding Journal,* v. 32, Apr. 1953, p. 198S-208S.
Factors which determine the flow of inert gases required for gas coverage and methods used for measuring them. Graphs and photographs. (K1)

273-K. New 'One-Step' Fastening Method Buttons Metal To Metal Without Rivets, Bolts. *Western Metals,* v. 11, Apr. 1953, p. 51-52.
Method which utilizes the principle of the common dressmaker snap. Photographs. (K13)

274-K. Proper Choice of Materials, Procedure Major Factors In Rohr's Complex Production Welding. J. T. Maloney. *Western Metals,* v. 11, Apr. 1953, p. 65-67.
Defines various welding techniques used for different parts of the work, including arc, inert-arc, and oxy-acetylene. Skill and care which are required to acquire quality demanded for steel and Al assemblies. Photographs. (K1, K2, ST, Al)

275-K. (Russian.) **Arc Welding of Copper Using Copper Electrodes.** P. T. Dmitriev, N. M. Stepanov-Grebennikov, and N. I. Makeev. *Avtogennoe Delo,* v. 23, Aug. 1952, p. 1-4.
Over 70 variations of coating composition were tested. Microstructures, mechanical properties, and corrosion stabilities of the welds were determined.
(K1, Q general, M27, R general, Cu)

276-K. (Russian.) **Conditions of Formation and Properties of Ferrite Banding During Pressure Welding.** A. S. Fal'kevich. *Avtogennoe Delo,* v. 23, Aug. 1952, p. 8-12.
Mechanical properties and microstructures of gas welded and induc-

tion welded tubes were determined. Tables and photomicrographs. (K2, Q general, M27, ST)

277-K. (Russian.) **Single-Pass Welding of 1X18H9T Tubes With a Ceramic Backup.** Iu. I. Kazennov. *Avtogennoe Delo*, v. 23, Aug. 1952, p. 22-23.

Use of ceramic backup rings for welding small stainless steel tubing (less than 50 mm.). (K general, SS)

278-K. (Russian.) **Automatic Submerged Arc Welding of Thin-Walled Containers.** M. I. Liber and V. N. Shmidman. *Avtogennoe Delo*, v. 23, Aug. 1952, p. 28-29.

Process is described. Joints were found to be more corrosion resistant than the base metal. (K1, R general, SS)

279-K. U. S. Army's New Atomic Rifle Carried by 8,200 Ft. of Welding. J. C. Spurgeon. *Industry & Welding*, v. 26, May 1953, p. 45-48, 50, 122-123.

Special welding techniques which maintain ⅛-in. tolerances in 38½-ft. weldments. Photographs. (K1, AY)

280-K. All-Welded Stainless Steel Flasks Operate at Pressures up to 3,000 Psi. A. Grodner. *Industry & Welding*, v. 26, May 1953, p. 54-55.

Welded fabrication of stainless steel high-pressure injection flasks. Diagrams. (K general, SS)

281-K. Safe Practices in Resistance Welding. Andrew E. Rylander. *Industry & Welding*, v. 26, May 1953, p. 58-60, 62.

Safety measures and devices. Photographs. (K3, A7)

282-K. Submerged-Arc Welding Reduces Weight of Kilns by 15 Percent. E. Krainer. *Industry & Welding*, v. 26, May 1953, p. 66-68, 70-71.

Details of construction and advantages. Photographs. (K1)

283-K. Automatic Inert-Arc Process Minimizes Iron "Pick-Up" in Welding Nickel-Clad. Richard G. Lyall. *Industry & Welding*, v. 26, May 1953, p. 82-84, 86.

New, fast welding process which can improve efficiency in fabrication of clad metals. (K1, ST)

284-K. How to Weld Copper-Clad Steels. *Industry & Welding*, v. 26, Apr. 1953, p. 101-102, 104; May 1953, p. 97-98, 100-101.

Principles and proper procedures for arc welding Cu-clad steels. Diagrams. (K1, Cu, ST)

285-K. The Welding of Mild Steel to Cast Iron. C. C. Bates. *Institute of Welding, Transactions*, v. 16, Feb. 1953, p. 5-11.

Welding of mild steel studs to gray cast iron was studied and a procedure evolved. Physical properties of fillet welds with and without "buttered pads". It was shown that it is possible to weld mild steel studs to heavy section gray cast iron and to obtain bend and torque strengths approaching those of the parent stud. Diagrams, tables, and photographs. (K general, Q general, CI)

286-K. Further Observations on Shipyard Layout and Technique for Welded Construction. H. H. Hagan. *Institute of Welding, Transactions*, v. 16, Feb. 1953, p. 12-16.

Effects of reducing number of berths, layout space, prefabrication shop area for hull steel, size of the berth cranes, and erection of welded ships. Development of weld examination by X-ray and γ-ray equipment. Welding technique, labor demarcation problems, and cost of welding. Diagrams and photographs. (K1, T22, S13, CN)

287-K. Active Metals Used as Brazing Alloys. *Metal Progress*, v. 63, Apr. 1953, p. 180, 182, 184.

Condensed by L. E. Abbott from "Metal to Nonmetallic Brazing", by C. S. Pearsall and P. K. Zingeser, Technical Report 104, Electronics Research Laboratory, Massachusetts Institute of Technology. (K8, Ti, Zr, Cb, Ta)

288-K. Development of Training and Jointing Techniques to Prolong the Life of Lead Cable Sheath. G. H. Fiedler and E. J. Nelson. *Power Apparatus and Systems*, Apr. 1953, p. 191-197; disc., p. 197-201.

Results of laboratory and field studies of the life of lead cable sheath as affected by mechanical movement. Possible solution to the problem of repair of field failures. Graphs and photographs. (K13, Pb)

289-K. How to Braze and Solder Zirconium. W. G. Schickner, John G. Beach, and C. L. Faust. *Steel*, v. 132, May 4, 1953, p. 118-119.

Shows that Zr can be soldered and brazed by regular methods if they are dipped in molten $ZnCl_2$ first. (K7, K8, Zr)

290-K. Spot Welding of Low-Carbon Steels, 24 S.W.G. and ⅛ In. Thick. H. E. Dixon and J. E. Roberts. *Welding Research*, v. 7, Feb. 1953, p. 3r-15r.

Experimental technique used to determine the optimum spot welding conditions for 24 s.w.g. mild steel sheet. Spot welding of ⅛-in. steel was also tested for strength and consistency over a wide range of conditions. Graphs, tables, and photographs. (K3, CN)

291-K. Measurement of Spot Welding Machine Variables. H. E. Dixon, J. E. Roberts, and T. M. Roberts. *Welding Research*, v. 7, Feb. 1953, p. 16r-24r.

Methods developed for the control of condenser discharge machines and applicable to other types of resistance welding equipment. Diagrams. (K3)

292-K. Welding Speeds Doubled. William P. Brotherton. *Western Machinery and Steel World*, v. 44, Apr. 1953, p. 88-89.

New technique and modified facilities increase spot welding speeds more than 100%. Photographs. (K3)

293-K. (Book.) **Electric Arc Welding.** John Benjamin Austin. 280 pages. 1952. American Technical Society, Drexel Ave. at 58th St., Chicago 37, Ill.

Handbook which serves as general background. Describes welding plant, electrodes, accessories, weldability of common metals and alloys, hard facing, pipe welding, machinery, and structural welding. Deals briefly with automatic arc welding. (K general)

L

CLEANING, COATING AND FINISHING

229-L. Small Plating Plants. How To Save Nickel Solution. *Iron Age*, v. 171, Apr. 16, 1953, p. 117.

Method of dumping Ni storage tanks which saves plating solution and money. (L17, Ni)

230-L. Descaling Stainless Steel Tube. Use of the Sodium Hydride Process by Accles & Pollock, Ltd. N. L. Evans. *Iron & Steel*, v. 26, Apr. 1953, p. 134-136.

Plant and performance of the process. Photographs. (L12, SS)

231-L. Chromium Diffusion for Corrosion and Abrasion Resistance. Fred M. Burt. *Metal Finishing*, v. 51, Apr. 1953, p. 72-75, 84.

Thermo-chemical process which makes iron and steel resistant to heat, corrosion, and wear. (L15, Cr, ST)

232-L. Control of Phosphating Solutions. Ion Exchanger a New Method for Rapid Analysis. Gunnar Gabrielson. *Metal Finishing*, v. 51, Apr. 1953, p. 76-78.

Exchange method which is comparatively rapid and sufficiently accurate for determination of phosphates and accelerators in phosphating solutions. Graphs and tables. (L14)

233-L. Vertical Furnace for Enamelling. *Metallurgia*, v. 47, Mar. 1953, p. 145-146.

Describes a continuous and reversible tower-type furnace. Photographs and diagrams. (L27)

234-L. Finishing Control Methods. Frank Spicer. *Product Finishing*, v. 6, Mar. 1953, p. 53-55, 98.

Advantages and how controls can be handled for viscosity, mixing, material supply, and air control. (L general)

235-L. Revolutionary Nickel Plating Process May Permit Many New Applications. *Refrigerating Engineering*, v. 61, Apr. 1953, p. 402.

The Kanigen process which uses chemical means for plating. Advantages. (L17, Ni)

236-L. Electropolishing of Copper Powder Compacts. E. Bull Simonsen. *Research*, v. 6, Apr. 1953, p. 24S-25S.

Investigation to determine effect of electropolishing on porosity. Micrographs. (L13, H general, Cu)

237-L. Here's How To Graft Aluminum Skin to Steel. D. K. Hanink and A. L. Boegehold. *SAE Journal*, v. 61, Apr. 1953, p. 40-45; disc., p. 46.

Based on "Coating Steel by the Aldip Process", presented at SAE Annual Meeting, Detroit, Jan. 12, 1953. The process, its metallurgy, Al content in diffused alloy layer, case depth, and oxidation resistance. Graphs and micrographs. (L16, Al, CN)

238-L. A Suitable Arrangement for Bath Heaters in Pickling Tanks. W. Mazurzak. *Draht* (English Ed.), Mar. 1953, p. 38-39.

Briefly describes layout and mechanism. Diagrams and photographs. (L12)

239-L. Galvanic Descaling, Derusting, Deburring, and Polishing and a Method of Acid Galvanizing. Richard Beck. *Draht* (English Ed.), Mar. 1953, p. 42-43.

Newly patented "Dynamisator" process. Diagram. (L16, L12)

240-L. Preparation for Hot Galvanizing. W. Haarmann. *Draht* (English Ed.), Mar. 1953, p. 50-51.

Advantages and procedure for galvanizing iron and steel. Diagrams. (L16, CI, ST)

241-L. (French.) **Pickling of Special Steels.** G. Batta, L. Scheepers, L. Winandy, and G. Dallemagne. *Revue de Métallurgie*, v. 50, Jan. 1953, p. 49-56.

Investigations with HNO_3-HCl-HF using $Fe_2(SO_4)_3$ in the pickling bath as an oxidizing agent. Tables. (L12, SS)

242-L. Problems of Utilizing Ceramics in Aircraft Power Plant Construction. Rodney A. Jones and Lester T. Fuszara. *American Ceramic Society Bulletin*, v. 32, Apr. 1953, p. 107-109.

Development and use for gas turbine buckets and nozzle vanes; rocket engine thrust cylinders; and thin protective coatings for various metal components. Photographs. (L27)

243-L. **A Study of the Enameling of Sheet Nickel.** J. H. Healy and A. I. Andrews. *American Ceramic Society Bulletin,* v. 32, Apr. 1953, p. 119.

Tremendous formation of bubbles and apparent lack of adherence of porcelain enamel to sheet Ni is attributed to CO_2 gases. Two methods of heat treatment for elimination of these defects. (L27, Ni)

244-L. **Spray Application and Control of Porcelain Enamel.** M. L. Pouilly. *Canadian Chemical Processing,* v. 37, Apr. 1953, p. 50, 52, 54.

For quality finishes consideration must be given to equipment used, spray technique employed, way the material is controlled, and how equipment is maintained. (L27)

245-L. **The Electrolytic Polishing of Amphoteric Metals.** E. J. Casey and R. E. Bergeron. *Canadian Journal of Chemistry,* v. 31, Apr. 1953, p. 422-438.

Experimental determinations of conditions necessary for electrolytic polishing of amphoteric metals in alkali hydroxide solutions. Effects of temperature, electrolyte concentration, current density, and time of current flow. Graphs, tables, and micrographs. 18 ref. (L13)

246-L. **Silverplate. Modern Automatic Processing.** *Canadian Metals,* v. 16, Apr. 1953, p. 44, 46.

How mechanized and automatic methods are used to prepare surface for plating. Photographs. (L17, Ag)

247-L. **Ion Exchange Processes in the Plating and Allied Industries. Part I. An Assessment of Their Position in the Plating and Anodising Process. Part II. Ion Exchange in Recovery Processes.** *Electroplating and Metal Finishing,* v. 6, Jan. 1953, p. 3-9; Apr. 1953, p. 121-130.

Part I: Effect on Zn plating of impurities in natural water; effects of suspended and precipitated matter; scummy films; impurities of Cl, Cu, Pb, carbonates, bicarbonates, nitrates, and organic matter; and demineralized water. Part II: Control of metal and trivalent contamination in Cr plating solutions and in chromic acid anodizing baths, recovery of chromic acid from rinse waters, and removal of Fe from phosphoric acid pickling baths. (L17, L19, Zn, Cr)

248-L. **Chemical Oxidation of Aluminium for Decorative Purposes.** *Electroplating and Metal Finishing,* v. 6, Apr. 1953, p. 133-135.

Different processes with emphasis on the M.B.V.-Type. Coloring or dyeing the coatings. (L14, Al)

249-L. **The Crosley Refrigerator Finish.** D. C. Williams and E. L. Faneuf. *Industrial Finishing,* v. 29, Apr. 1953, p. 22-24, 26, 28, 30, 33-34.

Problems and procedure for applying the coating. Photographs. (L27, CN)

250-L. **Catalyst Spraying.** W. Beacham. *Industrial Finishing,* v. 29, Apr. 1953, p. 36, 38, 40-41.

Use of a spray gun which mixes curing agent and paint as atomized particles. Photographs. (L26)

251-L. **Airless Spray Painting of Metal Ironing Boards.** E. A. Carpenter. *Industrial Finishing,* v. 29, Apr. 1953, p. 56-58, 60.

Procedure and its advantages. (L26, CN)

252-L. **Metal Cleaning Process by Detrex Utilizes Ultrasonic Waves.** *Industrial Heating,* v. 20, Apr. 1953, p. 737-740.

New method which utilizes a ceramic transducer element for directing sound energy. Advantages. Photographs. (L10)

253-L. Ultrasonic Waves Used for Industrial Cleaning. *Iron and Steel Engineer,* v. 30, Apr. 1953, p. 131-132.
Briefly describes equipment. Photographs. (L10)

254-L. Notes on the Peeling of Nickel Deposits. Edmund T. Richards. *Metal Finishing,* v. 51, Apr. 1953, p. 64-67; May 1953, p. 60-65.
Points out most important causes. Ways and means to avoid and counteract them. 53 ref. (L17, Ni)

255-L. Cleaning Precision Parts on a Jobbing Basis. Eugene F. Anderson. *Metal Treating,* v. 4, Mar.-Apr. 1953, p. 6-7, 30.
The wet blasting process and its advantages. Photographs. (L10)

256-L. Silver-Plated Aluminum Busbar. *Modern Metals,* v. 9, Apr. 1953, p. 46.
Use of a Zn-Cu-Ag plating treatment in order to utilize Al in the electric industry.
(L17, T1, Al, Zn, Cu, Ag)

257-L. The Determination of Boric Acid in Nickel Plating Baths. Earl J. Serfass, Robert B. Freeman, and Edwin Pritchard. *Plating,* v. 40, Jan. 1953, p. 59-62.
Effect of presence of Ni, precipitation agents, effect of impurities, mineral acid present, and procedure for determining the latter. Tables and graphs. (To be continued.) (L17, S11, Ni)

258-L. Developments in Automatic Printing and Coating of Steel Sheets at the Works of Rheem Lysaght Ltd. *Sheet Metal Industries,* v. 30, Apr. 1953, p. 281-284, 296.
Equipment for decorating metal packings and boxes. Photographs. (L26, ST)

259-L. The Mechanical Surface Finishing of Metals. (Concluded.) G. T. Colegate. *Sheet Metal Industries,* v. 30, Jan. 1953, p. 5-17; Apr. 1953, p. 303-305, 307.
Various aspects of barrel finishing, and factors which influence the end result. Barreling of ferrous metals. Blast processes and other miscellaneous methods. (L10, Fe)

260-L. Automatic Spraying, Drying and Brushing Unit for Vitreous-Enamelled Parts. *Sheet Metal Industries,* v. 30, Apr. 1953, p. 311-312.
Equipment and layout. Photographs. (L27)

261-L. Fully Mechanized Rotary Pickling Installation for Hot-Rolled Strip. E. W. Mulcahy. *Sheet Metal Industries,* v. 30, Apr. 1953, p. 330-331, 334.
Plant layout. Diagrams.
(L12, CN)

262-L. Hard Chromium Plating Salvages Critical Items; Increases Wearing Power. *Western Metals,* v. 11, Apr. 1953, p. 53-54.
How the plating process rebuilds worn parts and provides protective coverings. Photographs. (L17, Cr)

263-L. "One-Stop" Enameling Shop Has Flexible Operation for Variety of Finishes. *Western Metals,* v. 11, Apr. 1953, p. 68-70.
Various procedures adopted by an enameling firm to provide high-quality work with any type of finish on a variety of shapes in any quantity. Photographs. (L27)

264-L. Modern Pickling Plant for the Wire and Bar Industry. Norman Swindin. *Wire Industry,* v. 20, Apr. 1953, p. 409, 411-413.
Various problems encountered in heating the pickling bath, fume extraction, and recovery of spent pickle. Suggests the best methods to adopt for overcoming these difficulties. Diagrams. (L12)

265-L. Bindarine as an Addition Agent in the Deposition of Copper. W. Gauvin and C. A. Winkler. *Canadian Journal of Technology,* v. 31, Apr.-May 1953, p. 114-119.
Summary of experimental information about the action of bindarine as an addition agent in the electrodeposition of Cu for comparison with the results previously obtained with gelatin. Graphs. 16 ref.
(L17, Cu)

266-L. Phosphate Coatings Benefit Metal Finishing and Working. Allen G. Gray. *Metal Progress,* v. 63, Apr. 1953, p. 106-109.
Use of the coatings as paint base, corrosion prevention, and metal-working aid. Photographs. (L14, F1)

267-L. Are You Hard Facing Effectively? Howard S. Avery. *Mining Congress Journal,* v. 39, Apr. 1953, p. 106-111.
Outstanding advantages of hard facing and its application. Tables, diagrams, and photographs. (L24)

268-L. Finishes for Soft Soldering Electroplated Metal Coatings. E. E. Halls. *Product Finishing,* v. 6, Apr. 1953, p. 42-50, 106.
Advantages of Sn, Cd, and Ag plated coatings as well as process details for their use. Tables.
(L17, K7, Sn, Cd, Ag)

269-L. Pre-Treating Aluminium Components. *Product Finishing,* v. 6, Apr. 1953, p. 51-52, 108.
Advantages of the process and plant layout. Photographs. (L14, Al)

270-L. Some Causes of Paint Failure. E. Johnson. *Product Finishing,* v. 6, Apr. 1953, p. 53-57, 106.
Reviews faults which can be attributed to incorrect techniques, improper use of equipment, or poor pretreatment of the surface to be painted. (L26)

271-L. (German.) **Electrolytic Polishing and Its Applications.** A. Schwarz. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 95, no. 9, Mar. 1953, p. 273.
Electrolytic and mechanical polishing are contrasted. Materials, baths, and industrial applications. (L13)

M

METALLOGRAPHY, CONSTITUTION AND PRIMARY STRUCTURES

146-M. Effects of Macrostructure on the Performance of Alnico Permanent Magnets. Dolph G. Ebeling and Arthur A. Burr. *Journal of Metals,* v. 5, Apr. 1953; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 197, 1953, p. 537-544.
Effects of casting texture, grain orientation, and grain size. Single-crystal specimens were produced by special sintering and grain coarsening techniques to study effect of crystal orientation. Results indicate that permanent magnet performance is impaired by a refinement of grain size. Graphs, diagrams, and tables. 16 ref. (M28, P16, SG-n)

147-M. Vanadium-Uranium Constitutional Diagram. H. A. Saller and F. A. Rough. *Journal of Metals,* v. 5, Apr. 1953; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 197, 1953, p. 545-548.
Experimental procedures and results of studies made to determine constitutional diagram. Micrographs. (M24, V, U)

148-M. Statistical Grain Structure Studies. Plane Distribution Curves of Regular Polyhedrons. F. C. Hull and W. J. Houk. *Journal of Metals,* v. 5, Apr. 1953; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 197, 1953, p. 565-572.
Plane distribution curves were determined in order to clarify interpretations of grain structures and to assist in calculations of spatial grain size distributions. Characteristics of the distribution curve for the average metal grain are predicted. Graphs and tables. 10 ref. (M27)

149-M. A Note on the Lattice Spacings of Titanium at Elevated Temperatures. R. L. P. Berry and G. V. Raynor. *Research,* v. 6, Apr. 1953, p. 21S-23S.
Experiments indicate that specimens of Ti powder sealed in evacuated silica capillaries are unsuitable for high-temperature X-ray work. (M26, Ti)

150-M. The Lattice Spacing of Two Samples of Super-Purity Aluminium at 25° C. R. B. Hill and H. J. Axon. *Research,* v. 6, Apr. 1953, p. 23S-24S.
Experiments using X-ray techniques. (M26, Al)

151-M. Neutron Diffraction Studies of Various Transition Elements. C. G. Shull and M. K. Wilkinson. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 100-107; disc., p. 107.
Experimental results for V, Nb, Mo, W, Cr, Mn, and Fe. Graphs. (M22, V, Nb, Mo, W, Cr, Mn, Fe)

152-M. Recent Developments in Hard Metals. E. J. Sandford. *Alloy Metals Review,* v. 8, Mar. 1953, p.2-7.
Reviews recent work in phase relationships of cemented and flame plated carbides. Micrographs. 11 ref. (M27)

153-M. Examination of Porcelain Enamel With the Electron Microscope. Ivan Buck. *American Ceramic Society Bulletin,* v. 32, Apr. 1953, p. 114-117.
Application of the electron microscope to the examination of the ground coat-iron interface. Preliminary examinations of the interface and photomicrographs of crystals present in the ground coat.
(M27, L27)

154-M. The Origin of Specimen Contamination in the Electron Microscope. A. E. Ennos. *British Journal of Applied Physics,* v. 4, Apr. 1953, p. 101-106.
Electron beam contamination was studied in simple vacuum systems to determine how it originates and methods by which it may be prevented. 20 ref. (M21)

155-M. The Construction of Ball-and-Spoke Models of Crystal Structures. Helen D. Megaw. *British Journal of Applied Physics,* v. 4, Apr. 1953, p. 107-110.
Suggestions for simplifying calculations required in construction of models, and for making models more easily reproducible. (M26)

156-M. The Liquid Immiscibility Region in the Aluminium-Lead-Tin System at 650°, 730°, and 800° C. Morgan H. Davies. *Institute of Metals, Journal,* v. 81, Apr. 1953, p. 415-416.
Tests and results. (M24, Al, Pb, Sn)

157-M. Some Metallographic Observations on Aged Aluminium-Copper Alloys. I. J. Polmear and H. K. Hardy. *Institute of Metals Journal,* v. 81, Apr. 1953, p. 427-431.
Shows that "light phenomenon" is not formed as an integral part of aging process, but originates as a grain-boundary recrystallization process to relieve strains induced by

cold-water quenching and subsequent precipitation. Effect of very small additions of In or Sn on aging of Al-Cu alloys were investigated by optical and electron microscopy. 24 ref. (M27, N7, Al, Cu, In, Sn)

158-M. The Log-Log Plot of Solubility Data in Ternary Metallic Systems. H. K. Hardy. *Institute of Metals Journal,* v. 81, Apr. 1953, p. 432.

Slope of the solubility curve of an ideal ternary solution plotted on log-log coordinates was analyzed for the case when the phase in equilibrium is a ternary compound. Micrographs. (M24, Al, Cu, Mg, Zn)

159-M. Carbides in Chromium, Molybdenum, and Tungsten Steels. Kehsin Kuo. *Iron and Steel Institute Journal,* v. 173, Apr. 1953, p. 363-375.

Occurrence, nature, and internal relations of carbides in Cr, Mo, and W steels are studied by electrolytic extraction and X-ray powder methods with respect to the steel composition and heat treatment. Carbide reactions in these systems are compared and the different mechanisms are discussed. Diagrams and tables. 45 ref.
(M27, N8, ST, Cr, Mo, W, C-n)

160-M. Apparatus Used in the Development of Optical-Diffraction Methods for the Solution of Problems in X-Ray Analysis. W. Hughes and C. A. Taylor. *Journal of Scientific Instruments,* v. 30, Apr. 1953, p. 105-110.

Methods described involve observation of diffraction patterns of holes punched in thin cards to represent atomic arrangements. Details of the instrument that is used to observe these patterns and also of the pantograph-punch that is used to prepare the cards. Diagrams and micrographs. 18 ref.
(M22)

161-M. Looking Into the Nucleus. Francis Bitter. *Optical Society of America Journal,* v. 43, Apr. 1953, p. 233-236.

A brief elementary account of nuclear structure which was obtained from investigations of the hyperfine structure of atomic-energy levels. Graphs. (M25)

162-M. The Ultraviolet Microscope. E. Wilfred Taylor. *Optical Society of America Journal,* v. 43 Apr. 1953, p. 299-305.

Form of ultraviolet microscope of the refracting type in which source of radiation is a spark gap between fixed or rotating electrodes and the objectives are normally monochromats. Micrographs. (M21)

163-M. Recent Developments in Electron Microscopy. V. E. Gosslett. *Photographic Journal,* sec. B, *Journal of Photographic Science,* v. 1, Mar.-Apr. 1953, p. 64-70.

Concerned with most important postwar developments, with emphasis on instrument design and operation, including photographic techniques. Examples of use with steel and brass. Photographs and micrographs. 17 ref. (M21, ST, Cu)

164-M. The Hyperfine Structure of the $3p^2P_{1\text{-}2}$ State of Al^{27}. Hin Lew and Günter Wessel, *Physical Review,* v. 90, Apr. 1, 1953, p. 1-3.

Presents a recalculation of the nuclear electric quadrupole moment. 9 ref. (M25, Al)

165-M. Some Characteristics of a Low Voltage Electron Immersion Objective. W. W. H. Clarke and L. Jacob. *Physical Society, Proceedings,* v. 66, sec. B, Apr. 1953, p. 284-295.

Study of some characteristics of an objective producing low-energy beams. Rough form of trajectories of specially selected electrons was calculated by a step-by-step method in which the space charge factor was approximately determined at each stage of the motion. Graphs. 7 ref. (M21)

166-M. The Atomic Nucleus and Its Constituents. R. W. Peierls. *Physical Society, Proceedings,* v. 66, sec. A, Apr. 1953, p. 313-324.

Reviews present knowledge of the nucleus and that which was based on Rutherford's work. 10 ref. (M25)

167-M. The Structure of the Nucleus. M. H. L. Pryce. *Science Progress,* v. 41, Apr. 1953, p. 193-211.

Structure of matter; size and mass of the nucleus; constitution of nucleus; mass and binding energy; nuclear reactions and spectroscopy; stability; spin; magnetic moment; electric quadrupole moment; and shell structure. (M25)

168-M. Ferromagnetic Alloys in the System Copper-Manganese-Indium. Robert R. Grinstead and Don M. Yost. *American Chemical Society, Journal,* v. 75, Apr. 20, 1953, p. 1803-1809.

Investigation of Cu-rich portion of the Cu-Mn-In system was made using thermal, microscopic, and magnetic methods. Approximate limits of the α and β-phases were determined. Tables, diagrams, and micrographs.
(M24, Cu, Mn, In, SG-n)

169-M. Antimonial Lead Alloys. Part II. *Metal Industry,* v. 82, Apr. 17, 1953, p. 304.

Variations in results obtained in the study of Pb-Sb system by thermal analysis. (M24, Pb, Sb)

170-M. Preparation of Single Crystals of Titanium and Their Mode of Deformation. A. T. Churchman. *Nature,* v. 171, Apr. 18, 1953, p. 706.

Preparation by a modified strain anneal technique. (M26, Q24, Ti)

171-M. The Equation of Motion of a Dislocation. J. D. Eshelby. *Physical Review,* v. 90, Apr. 15, 1953, p. 248-255.

Elastic field surrounding an arbitrarily moving screw dislocation is found, and a useful analogy with 2-dimensional electromagnetic fields is pointed out. Results are applied to a screw dislocation accelerating from rest and approaching the velocity of sound asymptotically. Applied stress needed to maintain this motion is found on the assumption that the Peierls condition is satisfied near the center of the dislocation. General integral equation of motion is derived for a simplified dislocation model. (M26)

N

TRANSFORMATIONS AND RESULTING STRUCTURES

115-N. Stabilization of the Austenite-Martensite Reaction in a High Chromium Steel. S. C. Das Gupta and B. S. Lement. *Journal of Metals,* v. 5, Apr. 1953; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 197, 1953, p. 530-536.

Shows that no appreciable stabilization occurs in a 15% Cr, 0.7% C steel unless some martensite is initially present. Graphs and tables. 14 ref. (N8, SS)

116-N. Silver-Cadmium Eutectoid. G. R. Speich and David J. Mack. *Journal of Metals,* v. 5, Apr. 1953; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 197, 1953, p. 549-553.

Deals with the eutectoid which occurs at 50.5 wt. % Ag. Transformation of β was studied by isothermal methods. Graphs and micrographs. 10 ref. (N9, Ag, Cd)

117-N. Antimonial Lead Alloys. *Metal Industry,* v. 82, Apr. 3, 1953, p. 268.

Age hardening of pure Pb-Sb alloys. Shows that precipitation of a finely dispersed hard phase does not necessarily cause hardening.
(N7, Pb)

118-N. Crystallization of Silicon From a Floating Liquid Zone. Paul H. Keck and Marcel J. E. Golay. *Physical Review,* v. 89, Mar. 15, 1953, p. 1297.

Method for crystallization of Si from the melt without using any crucible material. (N12, Si)

119-N. (English.) **Measurements on the Evolution of Heat During the Recovery of Cold-Worked Metals.** G. Borelius, Stig Berglund, and Sven Sjöberg. *Arkiv För Fysik,* v. 6, no. 2, 1953, p. 143-149.

Measurements made on specimens of cast (Al, Zn) or turned and annealed (Cu) rods of 8-mm diameter. Graphs. (N4, Al, Zn, Cu)

120-N. (German.) **Thermodynamics of Phase Changes. Part I. Heterophase Transitions in Single-Substance Systems.** Günther Porod. *Acta Physica Austriaca,* v. 6, no. 4, 1952, p. 322-328.

Discusses transitions of two phases under different pressures. A simple differential equation was derived. Graphs. (N6)

121-N. (Swedish.) **Changes in Structure and Properties in Connection With Arc Welding of Creep Resistant Chromium-Molybdenum Steels.** Tore Norén. *Jenokontorets Annaler,* v. 136, no. 12, 1952, p. 511-548.

Includes austenite transformation studies based on TTT-diagram and Jominy curves of different heats. These were combined with extensive microscopic examination of welded tubes. (N8, K1, Cr)

122-N. The Kinetics of the Eutectoid Transformation in Zinc-Aluminium Alloys. R. D. Garwood and A. D. Hopkins. *Institute of Metals, Journal,* v. 81, Apr. 1953, p. 407-415.

TTT-diagrams were constructed for a Zn alloy containing 22.5% Al using data obtained in dilatometric, metallographic, and hardness studies. Discusses discrepancies which occur in the times for the completion of the transformation. Graphs. 27 ref. (N9, Zn, Al)

123-N. Diffusion of D_2 From D_2O Through Steel. Francis J. Norton. *Journal of Applied Physics,* v. 24, Apr. 1953, p. 499.

Experiments using heavy water (D_2O) to show that H_2 in H_2O participates in the initial corrosion rather than the H_2 present in the steel. (N1, R4, ST)

124-N. A Special Kind of Growth Structure in Metal Single Crystals. F. Blaha. *Nature,* v. 171, Apr. 11, 1953, p. 650-651.

Growth of single Zn crystals, using a method in which the growth boundaries are examined without etching, in their natural relief by means of a stereomicroscope.
(N12, M23, Zn)

125-N. An X-Ray Diffraction Study of the Transformation of Retained Austenite by Fracture. L. W. Pateman and H. S. Peiser. *Nature,* v. 171, Apr. 18, 1953, p. 696-697.

Results of the investigation.
(N8, Q26, AY)

126-N. Growth and Slip Patterns on the Surfaces of Crystals of Silver.

A. J. Forty and F. C. Frank. *Royal Society, Proceedings,* ser. A, v. 217, Apr. 8, 1953, p. 262-270.

Shows that dislocations in Ag crystals can be located by spiral growth patterns on the surfaces. Monatomic growth steps on both cube and octahedral surfaces are readily visible after they have been "decorated" by the tarnish produced by plasticine. Micrographs. 10 ref. (N12, M26, Ag)

P

PHYSICAL PROPERTIES AND TEST METHODS

170-P. Magnesium Alloy Characteristics. *American Foundryman,* v. 23, Apr. 1953, p. 156-158.

Tabulated information on mechanical and physical properties; composition; and characteristics of Mg casting alloys.
(P general, Q general, Mg)

171-P. Spin Waves in Ferromagnetic and Antiferromagnetic Materials. F. Keffer, H. Kaplan, and Y. Yafet. *American Journal of Physics,* v. 21, Apr. 1953, p. 250-257.

Brief outline of the spin-wave approximation to the near ground states of ferromagnetism and antiferromagnetism. Simple pictorial models of spin waves are introduced. Proper normal modes for antiferromagnetic spin waves are presented. Diagrams. 19 ref. (P16, SG-n, p)

172-P. Behavior of Magnetic Materials. R. M. Bozorth. *American Journal of Physics,* v. 21, Apr. 1953, p. 260-266.

Review of recent work in which atomic theory of ferromagnetism and domain theory of magnetization are applied to ferrites and fine particle magnets. Diagrams.
(P16, SG-n, p)

173-P. Measurement of the Half-Lives of AcC^{11}, Cu^{66}, Mg^{27}, Ti^{51}, Tl^{206}, and V^{53}. B. W. Sargent, L. Yaffe, and A. P. Gray. *Canadian Journal of Physics,* v. 31, Feb. 1953, p. 235-249.

Radionuclides were produced by irradiating pure metals or oxides with neutrons in the NRX reactor. β-activities were measured by rate of deflection of a quartz fiber in an electroscope. Half-lives were determined by the method of least squares. Tables and graphs. 40 ref. (P13, Cu, Mg, Ti, Tl, V)

174-P. Cross Section for the Reaction $Be^9(y, p)Li^8$. R. N. H. Haslam, L. Katz, E. H. Crosby, R. G. Summers-Gill, and A. G. W. Cameron. *Canadian Journal of Physics,* v. 31, Feb. 1953, p. 210-217.

Investigation in which the cross section for the reaction was determined for photon energies between the threshold and maximum energy available, 26 Mev. Graphs. 16 ref. (P13, Be)

175-P. The Photoneutron Cross Sections of Rb^{87}, Zr^{90}, and Mo^{92}. L. Katz, R. G. Baker, and R. Montalbetti. *Canadian Journal of Physics,* v. 31, Feb. 1953, p. 250-261.

Mathematical analysis, procedure and results. Graphs and tables. 23 ref. (P13, Rb, Zr, Mo)

176-P. The Initial Magnetization of Nickel Under Tension. B. N. Brockhouse. *Canadian Journal of Physics,* v. 31, Mar. 1953, p. 339-355.

Initial susceptibility and Rayleigh constant of pure Ni wire were measured between room temperature and the Curie point under various tensions. Graphs. 17 ref. (P16, Ni)

177-P. Fission Yields of the Stable and Long-Lived Isotopes of Cesium, Rubidium, and Strontium and Nuclear Shell Structure. D. R. Wiles, B. W. Smith, R. Horsley, and H. G. Thode. *Canadian Journal of Physics,* v. 31, Mar. 1953, p. 419-431.

Determination by the mass spectrometer. 17 ref. (P13, Ce, Rb, Sr)

178-P. Resonant Scattering of Slow Neutrons. B. N. Brockhouse. *Canadian Journal of Physics,* v. 31, Mar. 1953, p. 432-452.

Method for measuring as a function of neutron energy, the scattering cross section for slow neutrons of materials having high absorption. Measurements are presented for the low energy neutron resonances in Cd, Sm, Gd, Dy, Eu, Rh, and In. Graphs. 33 ref. (P13)

179-P. Magnetic Materials. G. H. Stearley. *Materials & Methods,* v. 37, Apr. 1953, p. 115-130.

Compositions, properties, characteristics, and applications of nonretentive, permanent, and special-property magnetic and nonmagnetic materials. Diagrams, tables, and photographs. 19 ref. (P16, SG-n)

180-P. Properties and Heat Treatment of Diffusion Hardening Permanent Magnet Alloys. *Materials & Methods,* v. 37, Apr. 1953, p. 135.

Tabulated information.
(P16, Q general, J general, SG-n)

181-P. Properties and Heat Treatment of Magnet Steels. *Materials & Methods,* v. 37, Apr. 1953, p. 137.

Tabulated information.
(P16, Q general, J general, AY, SG-n)

182-P. The Approach to Saturation in Dilute Ferromagnetics. Alan D. Franklin and Ami E. Berkowitz. *Physical Review,* v. 89, Mar. 15, 1953, p. 1171.

Study of the law of approach to magnetic saturation in finely divided and diluted iron powders.
(P16, H11, Fe)

183-P. Total Fast Neutron Cross Sections of Co, Ga, Se, Cd, Te, Pt, Au, Hg, and Th. M. Walt, R. L. Becker, A. Okazaki, and R. E. Fields. *Physical Review,* v. 89, Mar. 15, 1953, p. 1271-1272.

Cross sections were measured as a function of neutron energy from 0.1 to 3 Mev. Results give additional evidence that, neglecting resonance structure, total neutron cross-section curves have characteristic shapes which change slowly with atomic weight. Graphs. (P13)

184-P. The Absolute Determination of Resonant Energies for the Radiative Capture of Protons by Boron, Carbon, Fluorine, Magnesium, and Aluminum in the Energy Range Below 500 kev. S. E. Hunt and W. M. Jones. *Physical Review,* v. 89, Mar. 15, 1953, p. 1283-1287.

Experiments, targets, detection, and results. Graphs. 11 ref.
(P13, Mg, Al)

185-P. The Temperature Dependence of Drift Mobility in Germanium. R. Lawrance. *Physical Review,* v. 89, Mar. 15, 1953, p. 1295.

Method used to measure drift mobility of holes in 0.02-ohm per meter resistivity single crystal *n*-type Ge from 100 to 360° K. (P15, Ge)

186-P. Ferromagnetism. S. B. Batdorf. *Physics Today,* v. 6, Apr. 1953, p. 12-17.

Work performed to determine behavior of ferromagnetic materials. Diagrams and graphs.
(P16, SG-n, p)

187-P. Heat Effects in the Magnetization of Silicon Iron. L. F. Bates and G. Marshall. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 17-33; disc., p. 33.

Description of method which permits measurement of thermal changes which accompany step-by-step magnetization of ferromagnetic metals. Results are examined in the light of current domain theory and a theoretical procedure developed by Stoner and Rhodes. The thermal contribution resulting from change in intrinsic magnetization is subtracted from the recorded thermal change, and the residue is considered in detail. Graphs. 18 ref. (P16, Fe)

188-P. The Analysis of Magnetization Curves. Edmund C. Stoner. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 2-16.

Concerned with general problem of magnetization curves for obtaining more complete and definite information. Brief account of current experimental work. Graphs and tables. 16 ref. (P16)

189-P. Spontaneous Magnetization. Techniques and Measurements. W. Sucksmith, C. A. Clark, D. J. Oliver, and J. E. Thompson. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 34-41; disc., p. 41.

Magnetic measurements for a Cu-Ni alloy and a mixed ferrite. Two methods employed for determination are justified from the lowest temperature to within neighborhood of the Curie point. Tables and graphs. 12 ref. (P16, Cu, Ni)

190-P. The Permalloy Problem. R. M. Bozorth. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 42-48.

Determination of crystal anisotropy and saturation magnetostriction in various crystal directions. Graphs. 18 ref. (P16, Ni)

191-P. Uniaxial Anisotropy of a Permalloy Crystal. Seiji Kaya. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 49-53; disc., p. 53-55.

Effective temperature range for magnetic field cooling, annealing at the critical temperature, change of magnetic characteristics with time of annealing, torque curves, possible origin of uniaxial anisotropy, and deduction of constricted hysteresis loop from uniaxial anistropy. Diagrams. (P16, Ni)

192-P. An Experimental Study of Barkhausen Noise in Nickel-Iron Alloys. D. I. Gordon. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 56-57.
(P16, Ni)

193-P. Atomic Moments in Alloys. J. E. Goldman. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 108-113; disc., p. 113.

Saturation moment of ferromagnetic alloys is considered in view of the collective electron theory. Perturbations in band shape due to the fluctuating lattice potential are considered. Influence of order is treated on the basis of Slater's theory of the relation between long-range order and energy bands. Results of measurements of electronic specific heat and Hall effect are presented. Fe alloys, Cu-rich Ni-Cu alloys, and Ni_3Mn were used. Graphs and diagrams. 24 ref. (P16, Fe, Cu, Ni)

194-P. Magnetic Moment Orientation and Thermal Expansion of Antiferromagnetic CrSb. A. I. Snow. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 127.

Briefly describes investigation by neutron and X-ray diffraction techniques. (P16, Cr, Sb)

195-P. The High Temperature Magnetic Susceptibility of V, Nb, Ta, W, and Mo. C. J. Kriessman. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 122-126.

Temperature range of magnetic susceptibility measurements was extended from 1450 to 1850° C. A periodicity in the sign of the temperature coefficient of the magnetic susceptibility of the transition elements is discussed in relation to various theories of metals. Graphs and tables. 23 ref. (P16, V, Nb, Ta, W, Mo)

196-P. Some Magnetic and Electrical Properties of Gadolinium, Dysprosium, and Erbium Metals. S. Legvold, F. H. Spedding, F. Barson, and J. F. Elliott. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 129-130.

Describes determination. Graphs. (P15, P16, Gd, Dy, Er)

197-P. Rotational Relaxation in Nickel at High Frequencies. W. P. Mason. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 136-139.

Measurements of the ΔE effect and the decrement are compared with that expected from a calculation of domain wall relaxations for a distribution of domain sizes as determined by the optical measurements. Graphs. (P16, Ni)

198-P. Ultrasonic Attenuation in Magnetic Single Crystals. Sheldon Levy and Rohn Truell. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 140-145.

Describes experiments using Ni crystals. Graphs and diagrams. 9 ref. (P16, Ni)

199-P. Domain Pattern in Silicon-Iron Under Stress. L. J. Dijkstra and U. M. Martius. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 146-150.

Investigations into the detailed changes in domain structure of ferromagnetic material under externally applied stress. Micrographs. (P16, Fe)

200-P. Hall Effect in Ferromagnetic Materials. Emerson M. Pugh and Norman Rostoker. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 151-157.

Experimental results are reviewed for Fe, Co, and Ni; and Co-Ni and Ni-Cu alloys. Graphs and diagrams. 29 ref. (P16, Fe, Co, Ni, Cu)

201-P. Helmholtz Coils for Production of Powerful and Uniform Fields and Gradients. S. T. Lin and A. R. Kaufmann. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 182-190.

Describes the solenoid which was designed for precise magnetic susceptibility determinations on metals and alloys over wide temperature range. Diagrams, graphs, and tables. (P16)

202-P. The Theoretical and Experimental Status of the Collective Electron Theory of Ferromagnetism. E. P. Wohlfarth. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 211-219.

Quantum-mechanical and statistical-mechanical foundations of the collective electron theory. Graphs. 61 ref. (P16)

203-P. Microwave Resonance Absorption in Gadolinium Metal. Arthur F. Kip. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 229-231; disc., p. 232.

Measurements at 9000 and 24,000 mc. per sec. Graphs. 11 ref. (P10, Gd)

204-P. Experimental Study of the Coercive Force of Fine Particles. W. H. Meiklejohn. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 302-306.

Experiments described test the theory of fine-particle magnets. Particles of Fe, Co, and Ni, of size 100 to 2000A, were prepared by electrodeposition into a Hg cathode. Their sizes and shapes were determined with an electron microscope. Micrographs and graphs. 10 ref. (P16, Fe, Co, Ni)

205-P. A New Permanent Magnet From Powdered Manganese Bismuthide. Edmond Adams. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 306-307; disc., p. 308-309.

Development by powder-metallurgy techniques. (P16, H general, Mn)

206-P. Thin Films of Ferromagnetic Materials. E. C. Crittenden, Jr. and R. W. Hoffman. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 310-315; disc., p. 315.

Experimental observations on magnetic properties of thin evaporated films of Ni. Graphs. (P16, Ni)

207-P. Coercive Force of Precipitation Alloys. A. H. Geisler. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 316-322.

Shows that Cunico, Cunife, and various types of Alnico are structurally analogous, in that at the state of high coercive force the crystal structure of the precipitate is distorted from a cubic lattice to a tetragonal lattice. Single empirical relation was derived from data for these materials in which maximum coercive force is directly related to degree of tetragonality and saturation induction of the precipitate. Diagrams. (P16, N7, Ni, Cu)

208-P. The Physical and Magnetic Structure of the Mishima Alloys. E. A. Nesbitt and R. D. Heidenreich. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 322-323.

Investigation for cause of magnetic properties in Mishima alloys. (P16, Fe, Ni, Al)

209-P. The Texture of Fine Ferromagnetic Powders. L. Weil. *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 324-326.

Determination of coercive force. Diagrams. 15 ref. (P16, SG-n)

210-P. (English.) **Some Measurements on the Absorption of 75-200 keV Electrons in Aluminum.** Ingvar Carlvik. *Arkiv För Fysik,* v. 6, no. 1, 1953, p. 1-16.

Measurements using mica-window G. M. counters as detectors. Results are compared with existing range-energy relations. Diagrams and graphs. (P13, Al)

211-P. (English.) **Directional Correlation Measurements on Successive Nuclear Gamma Rays in Hf^{177}.** T. Wiedling. *Arkiv För Fysik,* v. 6, no. 1, 1953, p. 39-48.

Previous work, apparatus and procedure, and results. Graphs. 38 ref. (P13, Hf)

212-P. (English.) **Studies of the Resonance Absorption of Neutrons in Uranium With the Time-of-Flight Method.** E. Hellstrand and R. Persson. *Arkiv För Fysik,* v. 6, no. 1, 1953, p. 57-68.

Theoretical considerations, apparatus and procedure, and results. Graphs and diagrams. 15 ref. (P10, U)

213-P. (English.) **The Distintegration of Zr^{95} and Nb^{95}.** Hilding Slätis and Luisa Zappa. *Arkiv För Fysik,* v. 6, no. 1, 1953, p. 81-93.

Describes various techniques and sources for obtaining disintegration. Graphs. 41 ref. (P13, Zr, Nb)

214-P. (German.) **Properties of Anodically Generated Oxide Layers of Aluminum and Aluminum Alloys.** F. Solar. *Mitteilungen des Chemischen Forschungsinstitutes der Wirtschaft Osterreichs,* v. 7, Feb. 1953, p. 6-12.

Water vapor swelling, hardness, heat resistance, and emission properties. Graphs. (P15, Al)

215-P. (German.) **Antiferromagnetism.** Heinrich Labhart, *Zeitschrift für angewandte Mathematik und Physik,* v. 4, Jan. 1953, p. 1-24.

Discusses exchange effect of simple magnets; Curie temperature and position; magnetic properties; and transition from paramagnetic to antiferromagnetic state. Graphs. 88 ref. (P16, Fe)

216-P. (German.) **Solubility and Ionizability of Foreign Substances in Germanium Monocrystals.** W. Dürr, J. Jaumann, and K. Seiler. *Zeitschrift für Naturforschung,* v. 8a, Jan. 1953, p. 39-46.

Selective crystallization was used to separate impurities. Data are charted and tabulated. (P13, Ge)

217-P. (Italian.) **Correlation Existing Between Magnetic Properties and the Structure of Steels. Application to a Non-Destructive Control Method.** G. H. Dion. *La Metallurgia Italiana,* v. 45, Jan. 1953, p. 1-12.

Magnetic stage development on atomic, simple crystal, and macroscopic scales. (P16, S13, ST)

218-P. The Vapor Pressure of Copper. Herbert N. Hersh. *American Chemical Society, Journal,* v. 75, Apr. 5, 1953, p. 1529-1531.

Vapor pressure was determined by the Knudsen effusion method between 1240 and 1560° K. Apparatus and results. Tables. 12 ref. (P12, Cu)

219-P. A Thermodynamic Study of the Zinc-Indium System. W. J. Svirbely and Sidney M. Selis. *American Chemical Society, Journal,* v. 75, Apr. 5, 1953, p. 1532-1535.

Electromotive force measurements of galvanic cells were made from 700 to 790° K. and 635 to 690° K. Integral heats of mixing and relative partial molar free energies; heat contents; entropies for liquid alloys; and activities of Zn and In were calculated at 700° K. Liquidus curve on Zn side of eutectic was determined. Graphs and tables. 14 ref. (P12, M24, Zn, In)

220-P. An Apparatus for Measuring the Coefficient of Thermal Conductivity of Solids and Liquids. T. A. Marshall. *British Journal of Applied Physics,* v. 4, Apr. 1953, p. 112-114.

A flat plate type of apparatus. Values are given for coefficients of several typical dielectric cable materials over their working temperature range. Diagrams. 9 ref. (P11)

221-P. Determination of the Neutron Capture Cross Section for the Co^{59} (n,γ) Co^{60m} Reaction. N. Moss and L. Yaffe. *Canadian Journal of Chemistry,* v. 31, Apr. 1953, p. 391-395.

Procedures and results. 9 ref. (P13, Co)

222-P. Spreading of Liquid Metals on Solid Surfaces. A. Bondi. *Chemical Reviews,* v. 52, Apr. 1953, p. 417-458.

Properties which determine mutual wettability. Includes surface free energy of liquid and solid metals, metal oxides, and metal salts; interfacial free energy between them; and solubility and diffusion phenomena which affect the latter. Tables and graphs. 70 ref. (P10)

223-P. Electrical Phenomena in Adhesion. Part I. Electron Atmospheres in Dielectrics. Selby M. Skinner, Robert L. Savage, and John E. Rutzler, Jr. *Journal of Applied Physics,* v. 24, Apr. 1953, p. 438-450.

Phenomena of metal-polymer-metal adhesion. Origin of charges, how charge distribution can be related to experimental parameters, and what relation the charges have to adhesion. Diagrams. 32 ref. (P15)

224-P. Work Functions of Gas-Coated Tungsten and Silver Surfaces. G. L. Weissler and T. N. Wilson. *Journal of Applied Physics,* v. 24, Apr. 1953, p. 472-475.

Average electronic work functions of W and Ag surfaces, subjected to glow discharges in various gases (He, A, H_2, N_2, O_2, freon-12) and to water vapor, were determined by Oatley's magnetron contact potential method. History and treatment of the surfaces. Data presented were found to be reproducible. (P15, W, Ag)

225-P. Permanent Magnet Properties of Cobalt-Platinum Alloys. D. L. Martin and A. H. Geisler. *Journal of Applied Physics,* v. 24, Apr. 1953, p. 498.

Brief description. (P16, Co, Pt)

226-P. Bombardment of Ordered Cu_3Au by 1 MeV Electrons. C. E. Dixon, C. J. Meechan, and J. A. Brinkman. *Philosophical Magazine,* v. 44, Apr. 1953, p. 449-450.

Brief description of effects. (P15, Cu, Au)

227-P. Radiative Widths of Dipole Transitions in Light Elements. D. H. Wilkinson. *Philosophical Magazine,* v. 44, Apr. 1953, p. 450-452.

Tabulates available data. 35 ref. (P13)

228-P. Radiations of Pu^{243}. D. W. Engelkemeir, P. R. Fields and J. R. Huizenga. *Physical Review,* v. 90, Apr. 1, 1953, p. 6-10.

Radiations were studied with β- and γ-scintillation spectrometers alone and in coincidence. Incomplete disintegration scheme is deduced which leads to a total β-disintegration energy of 560 kev. Graphs. 11 ref. (P13)

229-P. Magnetic Structure Transitions. J. Samuel Smart. *Physical Review,* v. 90, Apr. 1, 1953, p. 55-58.

Problem of magnetic phase transitions between ferromagnetism and antiferromagnetism, or between two different kinds of antiferromagnetic arrangement. Such transitions may occur if the molecular field coefficients vary with temperature. 10 ref. (P16)

230-P. The Thermal Neutron Capture Cross Sections of Pa^{231} and Pa^{232}. R. Elson, P. A. Sellers, and E. R. John. *Physical Review,* v. 90, Apr. 1, 1953, p. 102.

Process for determining cross section. (P13, Pa)

231-P. Ultrasonic Attenuation Measurements in Germanium. Rohn Truell and Joseph Bronzo. *Physical Review,* v. 90, Apr. 1, 1953, p. 152.

Attenuation in solid materials was studied as a function of ultrasonic frequency and as a function of state or condition of the material. Differences in the state of a semiconductor can be examined by these measurements. (P15, Ge)

232-P. Temporary Traps in Silicon and Germanium. J. R. Haynes and J. A. Hornbeck. *Physical Review,* v. 90, Apr. 1, 1953, p. 152-153.

Evidence obtained from drift velocity measurements indicates the existence of trapping centers other than recombination centers for minority carriers in Ge and Si. (P15, Ge, Si)

233-P. The Magnetoresistance Effect in InSb. G. L. Pearson and M. Tanenbaum. *Physical Review,* v. 90, Apr. 1, 1953, p. 153.

Preparation of compound in a highly purified form and results of magnetoresistance measurements which verify the high electron mobility. 7 ref. (P16)

234-P. Activity Assignment to Titanium 51. William R. Hammond, D. N. Kundu, and M. L. Pool. *Physical Review,* v. 90, Apr. 1, 1953, p. 157.

Procedure for confirming 6-min. activity. 8 ref. (P13, Ti)

235-P. Radioactive Decay of Y^{91}. F. I. Boley and D. S. Dunavan. *Physical Review,* v. 90, Apr. 1, 1953, p. 158.

Decay was investigated using scintillation counters. Results indicate that decay is by negatron emission only and is unaccompanied by γ-rays. (P13, Y)

236-P. Evidence for a 25.5-Day Sr—76-Sec Rb Chain. Paul Kruger and Nathan Sugarman. *Physical Review,* v. 90, Apr. 1, 1953, p. 158-159.

Research on isotopes of Sr and Rb. (P13, Sr, Rb)

237-P. The Angular Correlation of the Cascade Gamma-Rays From the Decay of Au^{198}. Carlton D. Schrader, Edward B. Nelson, and James A. Jacobs. *Physical Review,* v. 90, Apr. 1, 1953, p. 159.

Correlation determines spin and parity of the 1.09-Mev level as 2+ and the 0.68-Mev radiation was found to be a 60% quadrupole, 40% dipole mixture. 6 ref. (P13, Au)

238-P. Ionic Current and Film Growth of Thin Oxide Layers on Aluminium. A. Charlesby. *Physical Society, Proceedings,* v. 66, sec. B, Apr. 1953, p. 317-329.

Part of a series of investigations into the electrical properties of thin insulating oxide layers formed electrolytically on Al. Limited to a study of ionic current and resultant film growth. Graphs. 16 ref. (P15, R2, Al)

239-P. Radiative Transitions in Germanium. J. B. Gunn. *Physical Society, Proceedings,* v. 66, sec. B, Apr. 1953, p. 330-331.

Briefly describes investigation. (P13, Ge)

240-P. Electronic Wave Functions. Part IX. Calculations for the Three Lowest States of the Beryllium Atom. S. F. Boys. *Royal Society, Proceedings,* v. 217, ser. A, Mar. 24, 1953, p. 136-150.

Investigation which resulted in more accurate wave functions. Tables. 11 ref. (P15, Be)

241-P. Dose Rates of Radiation From Thorium and From Enriched Uranium. T. E. Bortner and H. K. Richards. *U. S. Atomic Energy Commission,* AECD-3484, Apr. 9, 1951, 18 pages.

Measurements made with the extrapolation chamber. (P13, Th, U)

242-P. Grain-Oriented Iron-Silicon Alloys. G. H. Cole. *Electrical Engineering,* v. 72, May 1953, p. 411-416.

Ideals and procedures utilized in the development and production of grain-oriented Fe-Si alloys. Chemical analysis and some properties of these materials. Data show large magnetic advantage of using the material parallel to the direction in which the alloy is rolled and indicate why transformer core designs are influenced greatly by the development. Graphs and tables. 21 ref. (P16, Fe, Si)

243-P. Beta-Spectrum of Radium E. J. Pniewski and M. Danysz. *Nature,* v. 171, Apr. 18, 1953, p. 694-695.

Work to determine the low-energy region. Graphs. (P13, Ra)

244-P. Gamma-Ray Resonances in the Alpha-Particle Bombardment of Beryllium and Boron. F. L. Talbott and N. P. Heydenburg. *Physical Review,* v. 90, Apr. 15, 1953, p. 186-187.

Be and B were bombarded with α particles from an electrostatic generator at energies up to 3.0 Mev. Gamma-radiation yield was observed with scintillation counters. Graphs. (P13, Be)

245-P. The Infrared Absorption Characteristics of Thermiated Germanium. D. H. Rank and D. C. Cronemeyer. *Physical Review,* v. 90, Apr. 15, 1953, p. 202-203.

Investigation of infrared transmission of thermiated Ge and examination of the effect of annealing upon the absorption spectrum of a thermiated sample. (P17, Ge)

246-P. Gamma-Rays From Mg^{26}. John E. May and Bruce P. Foster. *Physical Review,* v. 90, Apr. 15, 1953, p. 243-247.

Energies of the α-rays found in coincidence with the protons of the $Na^{23}(a,p)Mg^{26}$ reaction were measured with a NaI(TI) scintillation counter. Includes discussion of possible spin and parity assignments and a few decay schemes proposed by the use of the Weisskopf lifetime formulas. Graphs. (P13, Mg)

247-P. Radioactivity of Pt^{191} and Pt^{193m}. J. B. Swan, W. M. Portnoy, and R. D. Hill. *Physical Review,* v. 90, Apr. 15, 1953, p. 257-258.

A 3.2-day activity of Pt^{191} and a 4.5-day activity of Pt^{193} were investigated. (P13, Pt)

248-P. Recombination Rate in Germanium by Observation of Pulsed Reverse Characteristic. E. M. Pell. *Physical Review,* v. 90, Apr. 15, 1953, p. 278-279.

Method for measuring recombination rates of minority carriers in Ge is described in which decay of injected carriers is observed directly as a function of time. Data show excellent agreement between this method and a light beam method. (P15, Ge)

249-P. High Energy Gamma-Gamma Cross Section of In^{115}. J. Goldemberg and L. Katz. *Physical Review,* v. 90, Apr. 15, 1953, p. 308-314.

Several photonuclear reactions induced in In by X-rays from a 25-Mev betatron were measured. Ratio of cross sections for production of the isomric and ground states of In^{114} was studied. (P13, In)

250-P. Decay Scheme of Magnesium^{28}. R. K. Sheline and N. R. Johnson. *Physical Review,* v. 90, Apr. 15, 1953, p. 325.

To study its decay scheme, a disk of Mg metal of ordinary isotopic composition was bombarded in an external beam of 39-Mev α particles for 9.2 hr. in 60-in. cyclotron. (P13, Mn)

251-P. The β-Half-Life of Pu^{241}. D. R. MacKenzie, M. Lounsbury, and A. W. Boyd. *Physical Review,* v. 90, Apr. 15, 1953, p. 327-328.

Briefly describes determination. (P13, Pu)

252-P. The Beta-Spectrum of Mg^{23}. Luis Marquez. *Physical Review,* v. 90, Apr. 15, 1953, p. 330-331.

Briefly describes measurements. (P13, Mg)

253-P. Thermo-Electric Behaviour of Tin and Silver at Liquid-Helium Temperatures. G. T. Pullan. *Royal Society, Proceedings,* Ser. A, v. 217, Apr. 8, 1953, p. 280-293.

New method which employs a superconducting galvanometer and requires a temperature difference of only 0.01° K between ends of specimen to measure absolute thermoelectric powers of Sn and Ag. Graphs. 23 ref. (P15, Sn, Ag)

254-P. (German.) **Electrochemical Behavior of Indium Amalgams.** N. Sundén. *Zeitschrift für Elektrochemie; Berichte der Bunsengeselschaft für*

physikalische Chemie, v. 57, no. 2, p. 100-102.

Relationship between an In electrode and In ions. Tables and graphs. (P15, In, Hg)

255-P. (Book.) **Physical Chemistry of Metals.** Lawrence S. Darken and Robert W. Curry. 535 pages. 1953. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. $8.50.

First section is devoted to descriptions of solid and liquid states of alloys and metals from the chemist's viewpoint rather than the solid-state physicist. Second section deals with classical chemical thermodynamics and the third law. Included is an extensive treatment of pressure-temperature-composition relations in heterogeneous systems where several phases may be of variable composition. (P12)

256-P. (Book.) **Washington Conference on Magnetism, Sept. 2-6, 1952. Sponsored by U. S. Office of Naval Research.** *Reviews of Modern Physics,* v. 25, Jan. 1953, p. 1-351.

Contains 66 papers and discussions presented at the conference held at University of Maryland. Many are separately abstracted. (P16)

Q

MECHANICAL PROPERTIES AND TEST METHODS; DEFORMATION

348-Q. Fatigue and Creep Testing of Aircraft-Engine Materials. *Engineering,* v. 175, Mar. 20, 1953, p. 353-355.

Equipment and procedure for testing gas-turbine blades. Photographs and diagram. (Q7, Q3)

349-Q. Formation of Deformation Bands in Al-3 Pct Mg Monocrystals During Cold Rolling. J. Herenguel, P. Lacombe, and P. Lelong. *Journal of Metals,* v 5, Apr, 1953; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 197, 1953, p. 559-564.

Investigation of an approximate twin relationship between the bands and surrounding crystal by progressive rolling reductions on monocrystals of varied initial orientation. Diagrams and micrographs. 12 ref. (Q24, Mg)

350-Q. The Influence of Solid Surface Films on the Friction and Surface Damage of Steel at High Sliding Velocities. E. E. Bisson. *Lubrication Engineering,* v. 9, Apr. 1953, p. 75-77, 100-101.

Beneficial and harmful effects of self-repairing and other types of films. Graphs. 11 ref. (Q9, ST)

351-Q. High-Density Alloys for Heavy-Weight Applications. Kenneth Rose. *Materials & Methods,* v. 37, Apr. 1953, p. 86-89.

Properties and uses of tungsten alloys with small amounts of Ni and Cu, fabricated by powder metallurgy methods.
(Q general, P10, T general, H general, W, Ni, Cu)

352-Q. Theory of Mechanical Wear. J. T. Burwell. *Research,* v. 6, Apr. 1953, p. 25S-27S.

Reviews previous work. 9 ref. (Q9)

353-Q. Stainless Steel Galling Characteristics Checked. H. Tanczyn. *Steel,* v. 132, Apr. 20, 1953, p. 150-152.

Method using torque wrenches, strain gages, and nut and bolt assemblies. Tabulated data are useful for selecting stainless steels for applications where galling occurs. (Q9, SS)

354-Q. (French.) **Deformation of Al-Cu Monocrystals by Repeated Shocks.** Yves Pironneau. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 236, Jan. 5, 1953, p. 46-48.

Apparatus for subjecting specimens to rapidly repeated tensile loads. Results show that elongation is proportional to absorbed energy. (Q27, Al, Cu)

355-Q. (French.) **Relationship Between Defects and Failure of a Material.** H. de Leiris. *Revue de Métallurgie,* v. 50, Jan. 1953, p. 14-20.

Possibility of localizing origin of a fracture by morphological analysis. Macrographs. (Q26)

356-Q. (French.) **Methods of Determining Hot Fatigue Limit in Common or Controlled Atmospheres.** Georges Vidal. *Revue de Métallurgie,* v. 50, Jan. 1953, p. 21-33; disc., p. 33-34.

Factors inducing fracture at high temperatures (creep, corrosion, fatigue). Apparatus for determination of hot endurance under alternating overloads in common, neutral, or corrosive atmospheres. Tests were made on pure Al, Co alloys, and chromal. (Q7, Al, Co, Cr)

357-Q. (French.) **Relation of Hardness and Impact Values to Tempering and Quenching Temperatures of Steels.** Frederik Herman Willeumier. *Revue de Métallurgie,* v. 50, Jan. 1953, p. 35-48.

New impact test which makes use of a forked hammer falling on test piece lying on two supports. Tests are made on various carbon and low alloy steels. Tables and graphs. (Q29, Q6, AY)

358-Q. (German.) **Wear Tests With "Lost" Markings.** P. Grodzinski. *Metalloberfläche,* v. 6, Dec. 1952, p. A190-A192.

Tests which indicate wear by decrease in the mark depth. Markings are now made by cutting rather than by impression. Micrographs. (Q9)

359-Q. (Swedish.) **Novel Alloys in Steel Production.** Harry Willners. *Jernkontorets Annaler,* v. 136, no. 11, 1953, p. 445-467.

Production and various properties of low-carbon, high-temperature steels. Effects of heat treatment, stabilizers, and various elements. Graphs and tables. (Q general, AY)

360-Q. (Swedish.) **High-Temperature Yield Point of Unalloyed and Low-Alloy Welding Materials.** Tore Norén and Bengt Ramshage. *Svetsaren,* v. 17, no. 3, 1952, p. 38-39, 42.

Experimental data on nonheat treated, stress-relieved, and normalized steel welded with eight different electrodes are graphed and tabulated. (Q27, K1, AY)

361-Q. Electrical Circuits for Adding Strain Gauge Signals. An Investigation of Modified Wheatstone Bridge Circuits. E. H. Mansfield. *Aircraft Engineering,* v. 25, Apr. 1953, p. 108-114.

Series-parallel, by-passed-gages, parallel series, and galvanometer arm circuits. Diagrams. (Q25)

362-Q. A Cast Iron That Bends and Bounces. *Inco Magazine,* v. 26, no. 1, 1953, p. 16-17, 28-29.

Properties of new engineering material (nodular iron) that bridges the gap between gray iron and cast steel. Photographs. (Q general, CI)

363-Q. The Influence of Thallium on the Creep of Lead. R. C. Gifkins. *Institute of Metals, Journal,* v. 81, Apr., 1953, p. 417-425.

Experiments designed to examine the influence of a particular solute atom on the creep of high-purity Pb. Results given consist of creep data together with microscopical and X-ray observations which illustrate variations in creep characteristics. Graphs and tables. 20 ref. (Q3, Pb, Th)

364-Q. New Tests on Steel Suggest Error in Poisson's Ratio. W. D. Manley. *Iron Age,* v. 171, Apr. 23, 1953, p. 148-150.

Tests using hot rolled 1020 bar stock which were conducted at Oak Ridge. Tables and photographs. (Q21, CN)

365-Q. Effect of Arsenic and Antimony on Temper-Brittleness. G. W. Austin, A. R. Entwisle, and G. C. Smith. *Iron and Steel Institute, Journal,* v. 173, Apr. 1953, p. 376-386.

Experiments using low-alloy steels. Study included effect of As and Sb on impact and tensile properties; mechanical implications of temper brittleness; and effect of embrittlement on low-temperature tensile brittleness. Graphs, tables, and micrographs. 25 ref. (Q23, AY)

366-Q. Temper-Brittleness in High-Purity Iron-Base Alloys. A. Preece and R. D. Carter. *Iron and Steel Institute, Journal,* v. 173, Apr. 1953, p. 387-398.

Effect of composition on occurrence of temper brittleness was examined by microscopical methods and measurement of transition temperatures. Tables, graphs, and micrographs. 9 ref. (Q23, Fe)

367-Q. Deformation of Austenite in Relation to the Hardness Characteristics of Steel. G. R. Bish and H. O'Neill. *Iron and Steel Institute, Journal,* v. 173, Apr. 1953, p. 398-405.

Pyramid hardness of 0.9% C steel during isothermal transformation at two temperatures just above the M_s line was determined. The same steel was plastically deformed by crushing during the incubation period of isothermal transformation at these two temperatures. Hardness and strain-hardening properties of various products of heat treatment were reviewed, and a complete hardness diagram for the Fe-Fe_3C system is given. 22 ref. (Q29, N8, CN)

368-Q. Effect of Boron on the Mechanical Properties of Low-Alloy Steels. R. Wilcock. *Iron and Steel Institute, Journal,* v. 173, Apr. 1953, p. 406-419.

Five low-alloy steels were made, each with one ingot treated with B and one ingot without B. Tensile and impact tests in the hardened and tempered condition were carried out on sizes up to 4 in. square. Hardenability was investigated by Jominy end-quench tests and hardness traverses. Tables and graphs. (Q general, J26, AY)

369-Q. Photoelastic Studies of Quenched Cylinders and Spheres. K. A. Parsons. *Journal of Applied Physics,* v. 24, Apr. 1953, p. 469-472.

Mathematical theory of residual stresses of quenching origin based on an idealized model of the quenching process is investigated. Photoelastic curves are computed from the theory and compared with those determined with a Babinet Compensator. Graphs and tables. (Q25, J26)

370-Q. The Role of Preferred Orientation in Elasticity Investigations. G. Bradfield and H. Pursey. *Philosophical Magazine,* v. 44, Apr. 1953, p. 437-443.

Investigates role of preferred orientation in elastic properties of polycrystalline metals and applies these considerations to experimental

results. Analysis is confined to metals in the cubic crystalline system with preferred orientation having circular symmetry about the axis of a bar. Expressions are derived for the apparent elastic constants of the bar in terms of the single crystal constants and an anisotropy index. Graphs. (Q21)

371-Q. Anomaly in the Rigidity Modulus of Copper Alloys for Small Concentrations. J. Friedel. *Philosophical Magazine,* v. 44, Apr. 1953, p. 444-448.

Reviews Mott's theory, extends it, and compares with experiments. Diagrams. 13 ref. (Q23, Cu)

372-Q. Neumann Bands in Pure Iron. A. Kelly. *Physical Society, Proceedings,* v. 66, sec. A, Apr. 1953, p. 403-405.

Examination using an X-ray microbeam method. Diagrams. (Q24, Fe)

373-Q. The Stress Distribution in the Head of a Thin-Walled Pressure Vessel. H. B. Fergusson, J. Kudar, and R. B. Harvey. *Quarterly Journal of Mechanics and Applied Mathematics,* v. 6, Mar. 1953, p. 1-14.

Equations of the membrane theory are written in terms of the meridional arc length and are shown to have an approximate solution valid for moderate thicknesses of the shell. Method is applied to a torospherical vessel head with a large bunged opening in the center. 7 ref. (Q25)

374-Q. Steels for High Temperature Service. Peter Payson. *Steel Processing,* v. 39, Apr. 1953, p. 168-174.

Creep and rupture tests carried out over a series of stresses and temperatures. Graphs and tables. (Q3, Q4, AY, SS, Ni, SG-h)

375-Q. Experimental Stress Analysis as an Aid to Machine Design. Emmett E. Day. *Trend in Engineering,* v. 5, Apr. 1953, p. 18-21.

Methods, possibilities, and limitations of analysis. (Q25)

376-Q. The Effect of Specimen Geometry on Impact Transition Temperature. R. S. Zeno and J. L. Dolby. *Welding Journal,* v. 32, Apr. 1953, p. 190S-197S.

Statistical study relating specimen size and notch geometry to transition temperatures. Temperatures were determined by absorbed energy, fracture appearance, and contraction of area under notch. Tables and graphs. (Q6, CN)

377-Q. A Note on the Performance of the Increasing-Load Wire Abrasion Tester. F. Levi. *Wire and Wire Products,* v. 28, Apr. 1953, p. 359-361, 419.

Author disagrees with claims presented in previous article. Outlines his views on correct procedures and evaluations of abrasion testing. (Q9)

378-Q. (Italian.) **Properties of Phosphorus and Copper-Alloy Low-Carbon Structural Steels. Part I. Engineering Properties.** Nello Collari. *La Metallurgia Italiana,* v. 45, Jan. 1953, p. 13-21.

Effects of P and Cu contents on tensile and impact properties were examined for normalized specimens. Prevention of phosphorus liquation is discussed. Data are tabulated. (Q27, Q6, AY)

379-Q. (Russian.) **Strength of Welded Pipe-Line Joints.** M. P. Anuchkin. *Avtogennoe Delo,* v. 23, Aug. 1952, p. 13-15.

Tests were made on oil-line pipes which had been in service 10 to 20 years. Causes of service failures. Tables and charts. (Q23, S21, CN)

380-Q. (Russian.) **The Function of Transverse Deformation.** R. A. Mezhlumian. *Prikladnaia Matematika i Mekhanika,* v. 16, June-Aug. 1952, p. 491-494.

Presents a graphical method of determining Poisson's ratio at any stage of deformation. 4 ref. (Q21)

381-Q. The Strength of Metals. A. H. Cottrell. *Chemical Metallurgical & Mining Society of South Africa, Journal,* v. 53, Dec. 1952, p. 177-181; disc., p. 181-182.

Explains in an elementary manner strength, yield stress, creep, brittle fracture, slip, and theory of yield and strain aging of mild steel. (Q23, CN)

382-Q. A New Test Rig for Static Tests on Structures and Components. F. Mueller-Magyari. *Engineers' Digest,* v. 14, Apr. 1953, p. 116-118. Translated and condensed from *Maschinenbau und Wärmewirtschaft,* v. 8, no. 1, Jan. 1953, p. 1-5.

A relatively small-scale universal stressing frame for experimental investigations on flat and dished plates, struts, and lattice structures. Diagrams. (Q27)

383-Q. Strain Gage Circuits From a Bottle. D. K. Wright and J. R. Jeromson, Jr. *Iron Age,* v. 171, Apr. 30, 1953, p. 102-103.

Shows that silver paint originally intended for printed electronic circuits can be used to make slip rings for strain-gage circuits. (Q25)

384-Q. Effect of Temperature on the Endurance Limit and Relaxation of Spring Materials. *Mainspring,* v. 14, Apr. 1953, unpaged.

Graphs show results for music wire, carbon valve, Cr-Si, high Mn, Cr-V, 18-8 stainless, and high speed steels. (Q7, ST)

385-Q. Experiences With Boron Steels in Production. Harry B. Knowlton. *Metal Progress,* v. 63, Apr. 1953, p. 67-74.

Use of B in steels to conserve Ni and Mo. Compares hardenability and mechanical properties of new steels with those they replaced. Use for heat treated parts and as case hardening steels. Photographs, graphs, and tables. (Q general, J26, AY)

386-Q. Maximum Temperature Applications for Type 316 Stainless. *Metal Progress,* v. 63, Apr. 1953, p. 184, 186, 188.

Condensed by R. E. Lochen from "High-Temperature Testing of Type 316 Stainless Steel Sheet", by G. J. Guarnieri, Report No. AECU-1936, U. S. Atomic Energy Commission, Oak Ridge, Tenn. Investigation to determine creep and rupture properties of Type 316 stainless sheet from 1200 to 1800° F. in annealed and as-welded conditions. (Q3, SS)

387-Q. Gencalloy A Lead-Alloy Cable Sheath. R. W. Atkinson, L. Meyerhoff, and W. H. Cortelyou. *Power Apparatus and Systems,* Apr. 1953, p. 246-252; disc., p. 252-256.

Data on creep and fatigue characteristics. Graphs and photographs. 16 ref. (Q3, Q7, T1, Pb)

388-Q. Stresses and Deflection in a Flat Plate With Clamped Edges Under Normal Pressure. J. K. Oaks. *Royal Aeronautical Society, Journal,* v. 57, Apr. 1953, p. 244-246.

Testing procedures, strain gages, and results. Graphs. (Q25, Al)

389-Q. (French.) Variation in Range of Microstressing. A. Braun. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 19, no. 3, Mar. 1953, p. 67-78.

Relationship between hardness value and load for various metals was tested in the 2.5-g. to 50-g. range using pyramidal points. Tests show a clear relationship between structural state of the metal and the dependence of hardness on load. Diagrams and tables. (Q29, Cu, Fe, Pb, Al, Ni, Ag)

390-Q. (German.) **Practical Measurements With Strain-Gage Strip Charts.** Kurt Fink and Christof Rohrbach. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 95, no. 9, Mar. 19, 1953, p. 265-273.

How strip charts allow more accurate results to be obtained in a variety of applications. Photographs and diagrams. 21 ref. (Q25)

391-Q. (Book.) **Designing by Photoelasticity.** R. B. Heywood. 414 pages. Chapman & Hall, Ltd., 37 Essex St., London, W.C.2, England. 65s. Od net.

How technique is applied, and the nature of the practically applicable results that can be obtained. The polariscope and its use; photo-elastic materials and models; frozen stress technique for 3-dimensional analysis; stress concentration in notches, screw threads, and at holes; and the application of stress concentration factors. (Q25)

392-Q. (Book.) **Mechanics of Materials.** Seibert Fairman and Chester S. Cutshall. 420 pages. John Wiley & Sons, Inc., 440 Fifth Ave., New York 16, N. Y. $5.75.

Stress and strain, mechanical properties of materials, bending, deflection, and impact. Presents area-moment method for beam deflection, columns, and combined stresses. (Q general)

R

CORROSION

165-R. Evidence of Corrosion Failures in Drill Stem Measures. A. P. Farr. *Corrosion,* v. 9, Apr. 1953, p. 108-111.

Corrosion fatigue which occurs in drill stems during drilling operations, cracks developing as a result of simultaneous action of cyclic stressing, and corrosion pitting. Diagrams and photographs. 8 ref. (R1, CN)

166-R. Drill Stem Corrosion in West Texas. Stanley C. Moore. *Corrosion,* v. 9, Apr. 1953, p. 112-113; disc., p. 113-114.

Heavy corrosion of drill stem from underlying salt strata. Tests on Mg and Al rings used in drill collarbox. (R8, CN, Mg, Al)

167-R. Electrochemical Behavior of Metals as a Basis for the Study of Corrosion. R. Piontelli. *Corrosion,* v. 9, Apr. 1953, p. 115-122.

Theoretical study of corrosion and passivity; inhibition; and certain factors in plating of metals and alloys. Experimental arrangements for the determination of polarization diagrams. Typical experimental results and some general rules concerning the electrochemical behavior of metals. Graphs and diagrams. 13 ref. (R1)

168-R. Mitigation of Pipe-Line Corrosion. Gerald L. Farrar. *Oil and Gas Journal,* v. 51, Apr. 20, 1953, p. 148, 150, 153.

Information taken from "Cable System Design for Cathodic Protection Rectifiers", R. M. Wainwright, and "Cathodic Protection

and High-Resistivity Soils", H. C. Van Nouhuys. Graphs. (R10)

169-R. Test Cooling Water for Corrosion by These Methods. M. C. Forbes. *Petroleum Refiner,* v. 32, Apr. 1953, p. 130-133.

Procedures and results. Diagrams. 9 ref. (R4)

170-R. Corrosion for Pipeliners. Part I. Introduction to Corrosion. Part II. Pipeline Coatings. Starr Thayer. *Pipe Line News,* v. 25, Mar. 1953, p. 21-22; Apr. 1953, p. 44-47.

Part I: Causes of corrosion in steel and general methods of testing. Part II: Use of cold paints, coal tar, and asphalt-base enamels. Special applications and future prospects. (R8, L26, ST)

171-R. Metallic Oxidation. A Simplified Treatment. U. R. Evans. *Research,* v. 6, Apr. 1953, p. 130-137.

Types of oxidation curves, mode of passage through the film, formation of holes, oxidation theories, Cu in O_2 at 1000° C., sulfide and iodide films, influence of boundary reaction, effect of internal boundary reaction, burning of metals, acceleration of attack by Mo and S, and retardation of attack by alloying constituents. Graphs. 53 ref. (R2, Cu, Mo)

172-R. New Alloy Tough on Corrosion. *Steel,* v. 132, Apr. 20, 1953, p. 139.

Physical, mechanical, and corrosion resistant properties of Hastelloy F which is a Ni-Mo-Cr-Fe mixture. (R general, P general, Q general, Ni)

173-R. (French.) **The Oxidation Process of Fe-Cr Binary Alloys at Elevated Temperatures.** Jean Moreau. *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences,* v. 236, Jan. 5, 1953, p. 85-87.

Results of study on alloys having 2.6, 7.5, 18, 23, and 30% Cr between 800 and 1250° C. (R2, AY)

174-R. (German.) **Faulty Firing as a Cause of Boiler Corrosion.** K. Schwarz. *Brennstoff • Warme • Kraft,* v. 5, Mar. 1953, p. 94-96.

Results of combined action of flue gas depositions and combustion. (R9)

175-R. (German.) **Effect of Inhibitors Upon the Dissolving of Iron in Acid.** J. Elze and H. Fischer. *Metalloberfläche,* v. 6, Dec. 1952, p. A177-A185.

Experimental data. Tables and charts. 9 ref. (R10, Fe)

176-R. Cathodic Protection Can Save Chemical Process Equipment. L. P. Sudrabin. *Chemical Engineering,* v. 60, May 1953, p. 196-200.

Techniques for the prevention of corrosion on buried oil and gas pipelines and on various steel structures submerged in water. Photographs. 12 ref. (R10, ST)

177-R. Protection of Underground Cable Sheaths. T. W. Alexander, Jr. *Iron and Steel Engineer,* v. 30, Apr. 1953, p. 97-100; disc., p. 100-102.

Shows that knowledge of stray ground currents helps materially in reducing underground corrosion. Diagrams. (R8)

178-R. The Influence of Ferrous Iron on Bacterial Corrosion. Mary E. Adams and T. W. Farrer. *Journal of Applied Chemistry,* v. 3, Mar. 1953, p. 117-120.

Rate of corrosion of cast iron by the action of sulfate-reducing bacteria is increased by the addition of ferrous Fe alone or the combined addition of ferrous Fe and yeast extract. Specific action of the added ferrous Fe is discussed and the rates of corrosion in heterotrophic conditions are compared with those in autotrophic conditions. Graphs. (R1, CI)

179-R. Sodium Benzoate and Sodium Nitrite as Corrosion-Inhibitors in Ethylene Glycol Anti-Freeze Solutions. Part I. Laboratory Investigations. Part II. Investigations in Working Vehicles. F. Wormwell, A. D. Mercer, and H. C. K. Ison. *Journal of Applied Chemistry,* v. 3, Jan. 1953, p. 22-27; Mar. 1953, p. 133-144.

Experimental procedures. Tables and graphs. (R10)

180-R. The War Against Corrosion. A. G. Thomson. *Mining Journal,* v. 240, Apr. 3, 1953, p. 388-390; Apr. 10, 1953, p. 422-424.

Annual losses due to corrosion in the mining industry. Various methods used to combat it. (R general, T28)

181-R. Resistance of Aluminum to Chemically Contaminated Atmospheres. W. W. Binger, R. H. Wagner, and R. H. Brown. *Modern Metals,* v. 9, Apr. 1953, p. 66-68, 70-72.

Al alloy applications which were developed to suit specific industrial requirements. Factors considered were mechanical properties, resistance to corrosion, workability, machinability, formability, weldability, and color matching. Photographs and graphs. (R3, Q general, G17, K9, Al)

182-R. How to Mitigate Corrosion in a Glycol-Dehydration Plant. N. K. Senatoroff. *Oil and Gas Journal,* v. 51, Apr. 27, 1953, p. 154, 156, 158, 201, 203-204, 206, 209.

Major factors which influence corrosion rates in dehydration plants, including pressure, fluid velocity, acidity, temperature, and concentration of oxidizing agents. Diagrams and photographs. (R5)

183-R. Influence of Organic Detergents on Metal Corrosion. T. K. Ross. *Metal Treatment and Drop Forging,* v. 20, Apr. 1953, p. 183-187.

Reviews some of the more active agents encountered in commercial detergent preparations. Properties of these agents and their reaction to various metals. Graphs. 8 ref. (R7, Cu, CN)

184-R. The Preservation of Oil Tanker Hulls. John Lamb and E. V. Mathias. *North East Coast Institution of Engineers & Shipbuilders, Transactions,* v. 69, Apr. 1953, p. 289-316.

Problems include protection of cargo compartment interiors. Measures already adopted or being considered to reduce corrosion. Tables, graphs, and micrographs. (R10, CN)

185-R. Here's What's Happening in Mitigating Corrosion in Processing Equipment. Gerald L. Farrar. *Oil and Gas Journal,* v. 5, May 4, 1953, p. 101, 103-104.

Information taken from "Inspection of Petroleum-Refinery Equipment," E. H. Tandy; and "Cathodic Protection of Heat-Transfer Equipment," R. W. Stetson and Burke Douglas. Diagrams. (R10)

186-R. Brine Corrosion of Steel Vessels. Cecil O. Smith. *World Oil,* v. 136, May 1953, p. 206, 208, 210, 215.

Cause of corrosion, its prevention by cathodic protection, and costs. Measurement of potential, current, and weight loss under field conditions. (R5, R10, ST)

S

INSPECTION AND CONTROL

126-S. High-Temperature Immersion Thermocouples. E. T. Myskowski and H. F. Bishop. *American Foundryman,* v. 23, Apr. 1953, p. 150-155.

Use of thermocouples for molten metals above 2100° F. Refinements in technique, and precautions which should be observed for maximum accuracy. Photographs. (S16)

127-S. Radiographic Inspection Assures Good Welds on Providence Distribution Line. Leslie S. Fletcher. *Gas Age,* v. 111, Apr. 9, 1953, p. 45-47.

Technique based on Co^{60} which provides simple and dependable method for inspecting welds in the field. Photographs. (S13, K9)

128-S. Some Metallurgical Applications of Ultrasonics. Alan E. Crawford. *Metallurgia,* v. 47, Mar. 1953, p. 109-113.

Factors governing design of ultrasonic generators for metallurgical applications, and ways in which ultrasonics can be used, particularly in the foundry. Diagrams, photographs, and graphs. 9 ref. (S13)

129-S. Electronic Measurement of Surface Coating Thickness. *Product Finishing,* v. 6, Mar. 1953, p. 47-50.

Circuit and method of operation of a typical instrument for detecting pinholes in paint and other coatings. (S14)

130-S. Radioactive Materials in Finishing Research. *Product Finishing,* v. 6, Mar. 1953, p. 56-63.

Application in electroplating, vitreous enameling, paint, coating research, and corrosion studies. (S19, L general, R11)

131-S. Mathematical Determination of the Thickness of Coatings on Wires of Round Cross Section. Anton Zastera. *Draht* (English Ed.), Mar. 1953, p. 48-49.

Formulas for determination. Graphs. (S14)

132-S. (English.) **The Polarographic Determination of Small Amounts of Tin in Zinc Die Casting Alloys.** Alfreds J. Sietnieks. *Acta Chemica Scandinavica,* v. 6, no. 8, 1952, p. 1217-1222.

Experimental data. (S11, Sn, Zn)

133-S. (French.) **Ultrasonic Inspection of Semi-Finished Products.** M. Hetzler and A. Michalski. *Revue de Métallurgie,* v. 50, Jan. 1953, p. 1-12.

Inspection of rolled and forged pieces, defect classification, structure effects, and comparison with acid testing. (S13)

134-S. (French.) **Automatic Control.** Tavernier. *Circulaire d'Informations Techniques,* v. 10, no. 2, 1953, p. 303-309; disc., p. 309-310.

Various types of automatic regulating equipment used in the iron and steel mill. (S18, D general)

135-S. X-Ray Fluoroscopy Analyzes Alloys. Ruben M. Brissey and George A. Chase. *American Machinist,* v. 97, Apr. 27, 1953, p. 132-133.

Instrument which qualitatively and quantitatively analyzes high-temperature alloys and stainless steel. (S11, SG-h, SS)

136-S. Nuclear Radiation. Its Detection and Measurement. Ernest H. Wakefield. *ASTM Bulletin,* Apr. 1953, p. 33-38.

Characteristics of six types of nuclear radiation, advantages and disadvantages of eight types of instruments for detecting and counting,

and kinds of electronic circuitry associated with the instruments. Diagrams and photographs. (S19)

137-S. Quality Control in Steel Production. *Canadian Metals,* v. 16, Apr. 1953, p. 22, 24.

Instrumentation is used to control variables in production of high-quality steels for high-speed, drill, and tool work. (S12)

138-S. Radiographic Thickness Measurement. *Canadian Metals,* v. 16, Apr. 1953, p. 43.

Method for rapid measurement in production of strip and sheet metal. (S14)

139-S. Gamma Radiography for Non-Destructive Testing. E. G. Fritz. *Canadian Metals,* v. 16, Apr. 1953, p. 56, 58.

Use of radioactive sources in radiographic metal inspection. (S13)

140-S. Steel Industry Water Instrumentation. Charles F. Hauck and Edward C. Eger. *Instruments,* v. 26, Apr. 1953, p. 569-571, 596, 598, 600.

In treatment, use, and disposal of water in the steel industry, instruments can reduce operating and supervisory labor requirements, minimize treating-chemical requirements, insure uniformly better-quality water, and protect water-using equipment. Points in the water system where instruments should be employed. Tables and diagram. (S18, ST)

141-S. Identification Marking of Blooms, Billets, and Slabs. Charles C. Hill, Jr. *Iron and Steel Engineer,* v. 30, Apr. 1953, p. 73-79; disc., p. 79.

Methods of marking commonly used in the steel industry. (S10, ST)

142-S. Control of Strip Thickness in Cold Rolling by Varying the Applied Tensions. R. B. Sims, J. A. Place, and P. R. A. Briggs. *Iron and Steel Institute, Journal,* v. 173, Apr. 1953, p. 343-354.

Performance of the prototype closed-loop controllers demonstrates that the gage of rolled strip may be controlled by automatically varying strip tension, depending on error signal from the mill load. Diagrams and graphs. 10 ref. (S14, F23)

143-S. Works Trial of the 'T' Method of Automatic Gauge Control. R. B. Sims, J. A. Place, and P. R. A. Briggs. *Iron and Steel Institute, Journal,* v. 173, Apr. 1953, p. 354-360.

Actual performance showed that the control methods worked satisfactorily on a production mill at high speeds without instability developing and without producing strip of poor shape. Photographs and diagrams. (S14, F23)

144-S. Narrow-Side Vertical Cracking in Ten-Ton Ingot Moulds. A. Jackson and A. N. Whiting. *Iron and Steel Institute, Journal,* v. 173, Apr. 1953, p. 360-362.

Annealing and strapping methods as means of preventing cracks. (S21, D9, J23, CI)

145-S. Specifications Relating to Aluminium and Magnesium. *Light Metals,* v. 16, Apr. 1953, p. 121-125.

New and revised specifications for alloys and many fabricated products. (S22, Al, Mg)

146-S. Determining Gas in Aluminium Melts. *Light Metals,* v. 16, Apr. 1953, p. 130.

Method and applications. (S11, Al)

147-S. Stability of a Bimetallic Disk. Part I. W. H. Wittrick. **Part II.** W. H. Wittrick, D. M. Myers, and W. R. Blunden. *Quarterly Journal of Mechanics and Applied Mathematics,* v. 6, Mar. 1953, p. 15-31.

General theory of deformation is developed and applied to the case of a disk initially in the form of a spherical cap. Expression is derived for the mean temperature which a disk of this type will maintain when used as the control element of a thermostat. Results are obtained for the temperature variation about this mean value. Diagrams and tables. (S16)

148-S. Control of Heat Treating Furnaces Improves Quality. Leo Walter. *Steel Processing,* v. 39, Apr. 1953, p. 177-181, 190.

Basic factors in temperature control, modes of furnace control, control theory, furnace types, and control methods. Diagrams and photographs. (S16, J general)

149-S. The Soviet Tool Industry. Measuring and Inspection Equipment. J. Mannin. *Engineers' Digest,* v. 14, Apr. 1953, p. 123-127.

Examples illustrate Soviet developments in precision indicators of various types, recording equipment for dimensional control, testing machines for special measuring tasks, and automatic inspection machinery. Diagrams. (S general)

150-S. 150-kV X-Ray Equipment for the Radiography of Circumferential Welds in Gas-Turbine Rotors. F. W. Waterton. *Institution of Electrical Engineers, Proceedings,* v. 100, Pt. II, Apr. 1953, p. 105-112; disc., 112-114.

Design, construction, and test results of a 150-kV 50-c/s continuously evacuated X-ray equipment. It was built to replace radium-bomb method for radiography of circumferential welds in a hollow fabricated drum or pipe in which the interior was not accessible for insertion of cassettes using an external source of radiation. Diagrams, photographs, and graphs. (S13)

151-S. Advanced Inspection Equipment Insures Close Tolerances. Charles H. Wick. *Machinery* (American), v. 59, Apr. 1953, p. 151-156.

Equipment used to inspect parts for De Soto Fire Dome V-8 engines. Photographs. (S14)

152-S. Aircraft Materials. G. M. Hutt. *Metal Industry,* v. 82, Apr. 17, 1953, p. 308.

Changes in the new Numerical and Classified List of D.T.D. Aircraft Material Specifications. (S22, T24)

153-S. Standards Ease Selection and Use of Carbide Tool Materials. H. H. Miller. *Metal Progress,* v. 63, Apr. 1953, p. 75-81.

Development of standards for producing sintered carbides based on chemical composition, hardness, specific gravity, transverse rupture strength, porosity, and microstructure. Carbides include W-Co, W-Co-Ta-Cb, W-Co-Ta-Ti-Cb, W-Co-Ta, W-Co-Ti, and W-Co-Ta-Ti. Typical applications. Tables and micrographs. (S22, T6, SG-j, W, C-n)

154-S. Boron and Tentative Standard Steels. *Metal Progress,* v. 63, Apr. 1953, p. 96B.

Tabulated information on composition. Issued by American Iron and Steel Institute, Feb. 1953. (S22, AY)

155-S. Experimenting at High Pressures. D. M. Newitt and K. E. Bett. *Nature,* v. 171, Apr. 18, 1953, p. 668-669.

Possibilities and limitations of testing techniques. (S18)

156-S. (Book.) **ASTM Standards on Light Metals and Alloys.** 205 pages. Mar. 1953. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Specifications for Al and Al-base alloys as ingots, castings, bars, rods, wire, forgings, pipe, tubes, wrought products for electrical purposes, filler metal, and electroplating. For Mg and Mg-base alloys specifications are given for ingots, castings, bars, rods, forgings, sheet, and tubes. Also gives general methods of testing. (S22, Al, Mg)

157-S. (Book.) **Ferrous Analysis. Modern Practice and Theory.** Rev. Ed. 2. E. C. Pigott. 690 pages. Chapman and Hall Ltd., 37 Essex St., London, W.C.2, England. 84s net.

Describes 31 quantitative methods for different elemental constituents of iron and steel. Absorptiometric, spectrophotometric, and spectrographic techniques are covered, and there is a section on microchemical analysis. Other sections give modern procedure for analysis of ferro-alloys, iron ores, and refractories. (S11, Fe)

158-S. (Book.) **Radioisotopes in Industry.** John R. Bradford, editor. 309 pages. 1953. Reinhold Publishing Corp., 330 W. 42nd St., New York 36, N. Y. $8.00.

Includes "Radioisotopes: A New Industry", T. Keith Glennan; "Radioisotopes for Industry", Paul C. Aebersold; "Fundamentals of Radiochemistry", John R. Bradford; "Radiation Protection", Otto Glasser; "Radioisotopes in Physical and Chemical Research", G. D. Calking; "Applications of Radioisotope Techniques", Charles Rosenblum; "Radiochemical Laboratories", Thomas B. Lanahan; "Design of Laboratories for Safe Use of Radioisotopes", Donald R. Ward; "Production and Separation of Radioisotopes", A. F. Rupp; "Tracer Experiments", Rex Fluharty; "Instrumentation in the Radiochemical Laboratory", V. L. Parsegian; "Decontamination and the Disposal of Radioactive Wastes", C. C. Ruchhoft; "Industrial Uses of Radioactive Fission Products", Paul M. Cook, William E. Hosken, and Paul J. Lovewell; and "Distribution of Radioisotopes by the Atomic Energy Commission", S. Allan Lough. (S19)

159-S. (Book.) **Spectrographic Analysis of Low-Alloy Steels. B.I.S.R.A. Special Report 47.** Iron and Steel Institute, 4 Grosvenor Gardens, London, S.W.1, England. 15s.

Method is applicable to analysis of low-alloy steels with an Fe content of 95% ± 1%. Elements which may be determined are Si, Mn, Ni, Cr, Mo, V, and Cu. (S11, AY)

T

APPLICATIONS OF METALS IN EQUIPMENT

107-T. The First Atomic Piles and the French Effort. Part I. Pre-War and Wartime Work. Part II. Post-War Work. Jacques Allier. *Atomic Scientists News,* v. 2, new ser., Mar. 1953, p. 225-248.

Traces history of atomic power and progress made by France, Britain, U. S., Canada, and Norway. (T25)

108-T. Effects of Modern Design Trends on Ball Bearing Research. L. D. Cobb. *Lubrication Engineering,* v. 9, Apr. 1953, p. 78-80, 102-103.

Effects of steel properties and lubricant characteristics on bearing design. Graphs. (T7, ST)

109-T. Manganese Steel Against the Sea. *Edgar Allen News,* v. 32, Apr. 1953, p. 81-83.

Application of Mn steel in equipment for dredging rivers and harbors. Photographs. (T4, AY)

110-T. Keeping "Battle" Lines Open. *Inco Magazine,* v. 26, no. 1, 1953, p. 9-11.

Strength, electrical properties, and corrosion resistance of cable for field telephones. Photographs. (T1, SS)

111-T. Aluminum. *Light Metal Age,* v. 11, Apr. 1953, p. 12-15.

New Alcoa office building which features an Al paneled exterior. Photographs. (T26, Al)

112-T. Aluminum in Bicycles. *Modern Metals,* v. 9, Apr. 1953, p. 32-34, 36, 38.

Although at first a failure, Al is now being sucessfully used in bicycles. Advantages and application details. Photographs. (T10, Al)

113-T. Aluminum Plus Smart Design in Materials Handling Equipment. *Modern Metals,* v. 9, Apr. 1953, p. 54-56, 58.

Shows how 61S-T6 and 63S-T6 Al alloys are used in well-designed materials handling equipment. Result is decreased operating costs. Photographs. (T5, Al)

114-T. Power-Only Reactors. The Direct Approach to Economic Nuclear Power. George L. Weil. *Nucleonics,* v. 11, Apr. 1953, p. 12-15, 60.

Discussion and comparison of several different approaches to the development of economic nuclear power. Design, financing, and engineering considerations of a single-purpose plant. (T25)

115-T. The Properties of Germanium Phototransistors. John N. Shive. *Optical Society of America, Journal,* v. 43, Apr. 1953, p. 239-244.

Describes, summarizes, and compares properties of point contact, *p-n* junction, and *n-p-n* junction multiplier phototransistors. Graphs and diagrams. (T1, P15, Ge)

116-T. Old Buildings Modernized With Stainless Exterior. Earl R. Woodward. *Sheet Metal Worker,* v. 44, Apr. 1953, p. 67-69.

Fabrication and construction details of stainless-clad building. Photographs. (T26, SS)

117-T. Modern Construction Uses Old Idea. *Steel,* v. 132, Apr. 27, 1953, p. 140-141.

Modern equipment and skills needed to produce metal lath for current requirements. Photographs. (T26, G general)

118-T. Investigation of Power Connectors for Use Outdoors With Aluminum Conductors. H. R. Harrison and R. W. Honebrink. *Electrical Engineering,* v. 72, May 1953, p. 393-397.

Work that was done on power connectors for outdoor use. Conclusions are pertinent to design and use of SnCu alloy or Al power connectors. Photographs and graphs. (T1, Al, Cu, Sn)

119-T. Properties and Manufacture of Valve Steels for the Automotive Industry. J. Cameron. *Metal Treatment and Drop Forging,* v. 20, Apr. 1953, p. 149-154.

Properties required for the ideal steel and factors governing the selection of their composition. Some of the steels in general use today, their manufacture, composition, and properties. (T21, AY, SS)

120-T. Investigation of Magnetic Mixtures for Clutch Application. W. P. Jones. *Power Apparatus and Systems,* Apr. 1953, p. 88-92.

Selection, preparation, method of evaluation, and results obtained with various mixtures of powdered iron, oil, and special additives. Diagrams and graphs. (T7, Fe)

121-T. Long Life Promotes Carbide Blanking Dies. Norman W. Oberg. *Steel,* v. 132, May 4, 1953, p. 100-102.

Advantages and benefits obtained from sintered WC blanking dies. Tables. (T6, W, C-n)

122-T. Tungsten in the Lamp Industry. George R. Moritz and W. E. Anderson. *Westinghouse Engineer,* v. 13, May 1953, p. 82-87.

Production of W wire and its application in electric lamps. Photographs. (T1, H general, W)

V

MATERIALS
General Coverage of Specific Materials

51-V. New High-Temperature Materials. Paul Schwarzkopf. *American Machinist,* v. 97, Apr. 13, 1953, p. 147-150.

Use of TiC and borides of Mo in product design; forming and machining; and production planning. (H general, T general, Ti, Mo)

52-V. Titanium—a Survey. P. L. Teed. *Engineering,* v. 175, Feb. 20, 1953, p. 251-252; Mar. 13, 1953, p. 341-342; Mar. 27, 1953, p. 413.

Properties, applications, production, and forging of Ti. Part 2: Alloys with metals, gaseous elements, and nonmetallic solids. Economic data for available alloys. Part 3: Additional properties. Tables and diagrams. (Ti)

53-V. Permanent Magnets Attract More Industry Attention. Ernest E. George. *Steel,* v. 132, Apr. 20, 1953, p. 110-113.

Shows that strategic Ni and Co hinder production. Compares casting and sintering processes and their uses. Improved magnetic materials and powder metallurgy techniques have removed size and shape barriers. Photographs. (E general, H general, SG-n, p)

54-V. Precipitation Hardening Stainless Steels. James Joseph. *Aero Digest,* v. 66, Apr. 1953, p. 52, 54, 56, 58.

Properties and advantages. Photographs. (Q general, SS)

55-V. Alloy Steels for Special Purposes. J. Lomas. *British Steelmaker,* v. 19, Apr. 1953, p. 182-185.

Some toolsteels are described with recommended data for forging, heat treatment, and inspection. (F22, J general, S general, TS)

56-V. (Pamphlet.) **Symposia on Materials and Design for Lightweight Construction. The Titanium Seminar.** Office of Technical Services, U. S. Department of Commerce, PB 111083, 95 pages.

Includes "History of Titanium"; "Present Production Status of Titanium"; "Production, Properties and Uses of High Purity Titanium"; "Physical and Mechanical Properties of Commercial Titanium and Its Alloys"; "Corrosion Resistance of Titanium and Its Alloys'; "Casting and Forging of Titanium and Its Alloys"; and "Applications and Potential Uses for Titanium and Its Alloys". (Ti)

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

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RESEARCH ASSISTANT: For project on physical properties of aircraft alloy steels as affected by special heat treatments. Mechanical testing, metallography, statistical studies, and writing technical papers for publication are carried out in well-equipped laboratories. Opportunity for tuition-free advanced study. One month vacation. Minimum requirement B.S. in metallurgy. Send full statement of qualifications and salary expected to: Dr. Cyril Wells, Metals Research Laboratory, Carnegie Institute of Technology, Pittsburgh 13, Pa.

JUNIOR SALES ENGINEER: Well-established distributor of corrosion resistant metals desires young engineer with inclination toward sales to learn business. Good opportunity for young man who qualifies. Box 6-110.

METALLURGIST: Academic opening for metallurgist having doctorate for teaching and research in physical metallurgy at a midwest university. Salary and rank commensurate with qualifications. Box 6-115.

East

METALLURGIST: Recent graduate with or without previous experience, for supervisory position in heat treat department of well-known tool manufacturer located in Central New York State. Excellent opportunity for man interested in the heat treatment of alloy and toolsteels. Please submit summary of training and experience. Salary open. Box 6-15.

METALLURGIST: With aptitude for research and development in field of high alloy steels. Prefer man with laboratory experience, possessing sound background in physical metallurgy, capable of writing clear, concise reports. Opportunities for professional development through publications and association with recognized authorities. In reply indicate training, experience, military status and salary requirements. Box 6-20.

MATERIALS ENGINEER: Metallurgical engineering degree and background preferred. To head materials section. Position encompasses selection and approval of all materials used in armored vehicle design including heat treats, finishes, military specifications, determination of substitutions and investigation of failed materials. Up to 15 years experience in general field desirable. Salary commensurate. Location in Schenectady, N. Y. Send letter of application to: G. Y. Taylor, director, Personnel Department, American Locomotive Co., Schenectady, N. Y. Refer to Position 0-31.

PROJECT ENGINEER and CHIEF DRAFTSMAN: Both by established small company in engineering and metals field with equally divided industrial and long-range research-development defense project. Located in small midwest home city with little industry. Require loyalty, mentality, vitality, stability, judgment. Excellent opportunity. Write fully, including salary earned and expected. Box 6-120, Metals Review.

METALLOGRAPHER: Connecticut concern over 100 years in business with new modern equipped plant and laboratory. Knowledge of both ferrous and nonferrous metals with experience desired. Submit credentials in detail with sample of work and photograph. Box 6-25.

West

MANUFACTURERS REPRESENTATIVE: Precision casting organization now being formed, to be located in Los Angeles, needs sales representation on West Coast, particularly in Los Angeles area. Regular contact with users of small parts essential. Familiarity with this process helpful but not necessary. Write giving full details as to sales experience and lines currently represented. Box 6-30.

Southwest

PHYSICAL METALLURGIST: By technical institute, for mechanical engineering department. Prefer person with doctorate degree with both teaching and industrial experience. Rank and salary depend on academic training and experience. Opening for fall semester. Box 6-125.

POSITIONS WANTED

NONFERROUS PHYSICAL METALLURGIST: B.S. degree, age 30, married. Seven years experience in development and trouble shooting with copper-base and titanium-base alloys. Imaginative and aggressive with good mechanical aptitude. Considerable experience in casting, forging, rolling, wire drawing, welding and heat treating. Desires responsible position with well-organized, growing concern. Box 6-35.

METALLURGIST: Age 32, Ph.D. degree with several years of research experience on physical metallurgy and production job in copper refining and steelmaking before the advanced degree. Desires position in research, development or teaching. Box 6-40.

METALLURGICAL ENGINEER: B.S. degree, age 33, married. Eight years laboratory background in ferrous and nonferrous production problems in piston and jet aircraft engine manufacture. Experience includes metallography, X-ray diffraction, heat treatment, quality control and report writing. Desires position in research, development or control. Prefers East. Box 6-45.

METALLURGICAL ENGINEER: M.S. degree, age 34, married. Nine years diversified experience in ferrous and nonferrous metallurgy—two years foundry, four years automotive, one year aircraft, two years officer-in-charge of Naval laboratory. Specification and procedure writing, failure analysis, process development and control, administrative and coordinating experience. Available August 1. Box 6-50.

METALLURGIST: Age 36. Fifteen years diversified experience in plant metallurgy, claims, metallography, physical testing, chemical analysis of ferrous metals, heat treating, research and development of high-temperature

MANUFACTURERS REPRESENTATIVE located in New York Area covering Eastern States for leading manufacturer of heavy equipment, wants additional accounts. Prefers machine tools, industrial furnaces or other capital equipment. Box 6-10, Metals Review.

alloy tool and die steels, supervision of induction melting of ferrous and nonferrous metals (moldable, foundry and malleable). Desires responsible position in production, sales or service of toolsteel or related products. Prefers East or Midwest. Box 6-55.

METALLURGIST: M.S. degree, British. Four years diversified experience, mainly in research. Work on high-temperature properties of nonferrous metals. Development of creep resistant, copper-base alloys. Experienced in all phases of manufacture in brass tube mill (refining, casting, piercing, extrusion, drawing). Present work on deep drawing steel sheet and fundamental creep investigation. Box 6-60.

SALES ENGINEER: B.S. degree in chemical engineering. Age 36, family. Desires position in Chicago area. Six years industrial experience in sales engineering. Chemical, metallurgical and mechanical background. Box 6-65.

METALLURGICAL ENGINEER: Twenty years production metallurgy and process development work. Experienced in all types of production heat treating, including induction, with all types of steel. Thorough background with phase diagrams and S-curves. Good quality control and materials handling record. Desires position as production or staff metallurgist. Box 6-70.

TECHNICAL SUPERVISOR: Responsible position with progressive manufacturing organization desired by B.S. in metallurgical engineering. Age 33, with eight years of industrial experience in alloy development, production control, materials engineering, technical administration, and sales development, with emphasis on stainless and high-alloy materials. Location immaterial. Box 6-75.

METALLURGICAL ENGINEER: For materials engineering, customer service, or development. Small company preferred. Fifteen years varied industrial experience, including process development, plastics molding and automotive metallurgical control. Five years university engineering teaching experience. Degrees in chemistry and metallurgical engineering, advanced metallurgical training. Box 6-80.

METALLURGICAL ENGINEER: M.S. degree, age 29. Seven years diversified experience on both ferrous and nonferrous materials, production quality control, heat treatment, precision castings, research. Desires supervisory position in manufacturing, foundry, etc., with future leading to management. Box 6-85.

SALES or SALES MANAGEMENT: Former sales manager and executive vice-president, a sheet steel producer with nation-wide sales contacts looking for sales or sales management job in any phase of steel industry. Minimum salary $10,000. Excellent record of sales and sales management. Can assure prospective employer of maximum results in minimum of time. Age 47, free to travel anywhere. Box 6-90.

SPECTROGRAPHIST - METALLURGIST - CHEMIST: Twelve years metallurgical analysis. Chemical, spectrographic and direct reading spectrograph experience. Ferrous and nonferrous alloys. Nine years in supervisory capacity. Experienced instrument maintenance. Located in Chicago area, but will relocate. Prefer southwestern U.S.A. Age 40, will travel. Box 6-95.

METALLURGIST: Coming from India to Canada in August. Ph.D. degree in metallurgy. Age 46, married, family. Degrees in geology and metallurgy. Experience includes position as senior research metallurgist for five years, and assistant director of a research organization. Specialties include development of ordnance steels, ferro-alloys and specialized steels such as electric steel sheets, etc. Has organized large technical research laboratory, and served as government inspector of materials and metals. Holds metallurgical honors and has published numerous papers in India and abroad. Box 6-100.

METALLURGIST: B. S. in chemical engineering. Age 36, married. Experience in production control, heat treat, development and research, steel and bearing industries. Also production and heat treat supervisor aluminum castings. Chicago area. Box 6-105.

POWDER METALLURGIST: Degree, married. Diversified supervisory experience in research and development, processing, production and quality control methods in powder metallurgy, both fabrication and powder manufacture. Presently employed. Desires responsible position in research, development, processing or sales with expanding company. Box 6-130.

RESEARCH METALLURGIST: Recent Ph.D. degree with chemistry background. Three years experience in research for college and one year diversified metallurgical experience. Desires position in progressive industrial laboratory engaged in fundamental and applied metallurgical research. Prefers south, but will consider other locations. Married, age 33. Box 6-135.

METALLURGICAL ENGINEER: B.S. degree in metallurgical engineering. Four years experience including various types of welding, silver brazing, radiography, foundry techniques, manufacturing problems, and evaluation of materials for use in reciprocating and jet aircraft engines. Desires responsible position in production or development. Veteran, married, age 28. Box 6-140.

METALLURGICAL ENGINEER: B.S. degree, presently employed, age 32, veteran, married. Four years diversified experience in metallurgical research and development work, 3 years practical experience in foundry. Desires position with future in technical sales and development work. Will relocate. Box 6-145.

METALLURGICAL ENGINEER: Graduate engineer for a well-equipped metallurgical research laboratory. Will participate in various phases of experimental heat treating (both conventional and induction methods), planning, conducting, and preparing reports on projects and programs. Excellent working conditions. Please send resume, photograph, salary desired to: W. H. Schuerman, International Harvester Co., Manufacturing Research, 5225 S. Western Blvd., Chicago 9, Ill.

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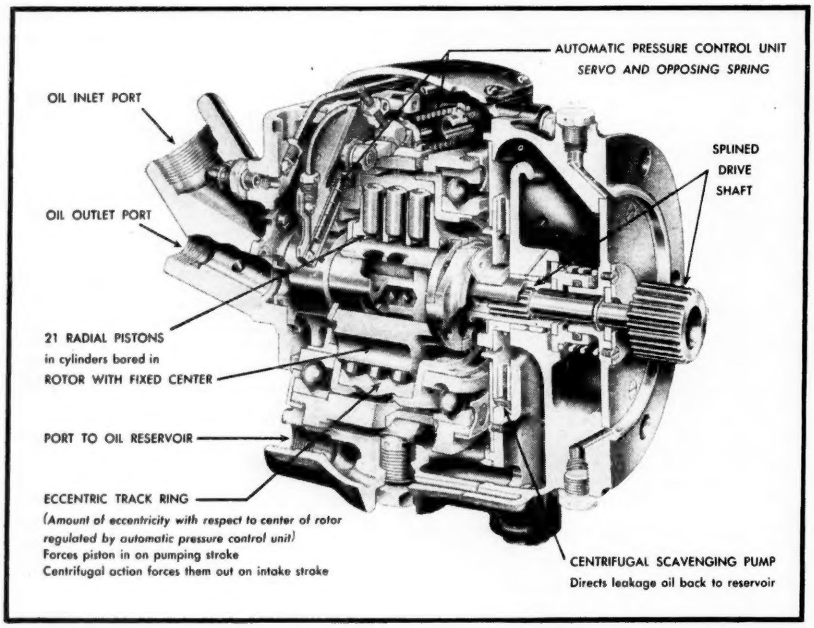

Problem: Modern jet aircraft use hydraulic power not only to actuate landing gear, but also to supplement the pilot's physical strength in moving primary control surfaces when flying at high speeds. Since requirements for this power vary tremendously over widely divergent flight conditions, the pump supplying it must be able to deliver large amounts of oil when needed, and yet operate efficiently with lower power absorption at other times. It also must provide high volumetric efficiency at high speed to avoid cavitation.

Our Answer: A compact, 22-pound unit capable of operating at higher speeds than other commercially developed pumps. The Hamilton Standard variable displacement pump automatically adjusts its flow to meet the requirements of constantly changing flight conditions. It delivers twenty gallons per minute at 6300 rpm yet embodies an automatic stroke control which reduces the oil flow to zero at 3000 psi. Since pistons are filled by centrifugal action, pump is free from cavitation at high speeds.

What's Your Answer? Hamilton Standard's hydraulic pump is operating with high efficiency in today's jet aircraft. But for the future, in order to extend its use to permit operation with fluids of greatly increased temperature, further metallurgical development will be necessary.

This is just one of many challenging engineering projects at Hamilton Standard. In addition to pumps, our growing line of jet aircraft equipment already includes turbine engine starters, fuel controls, cockpit cooling systems, auxiliary drives and other as yet "classified" products. There are also many exciting new developments in world-renowned Hamilton Standard propellers.

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